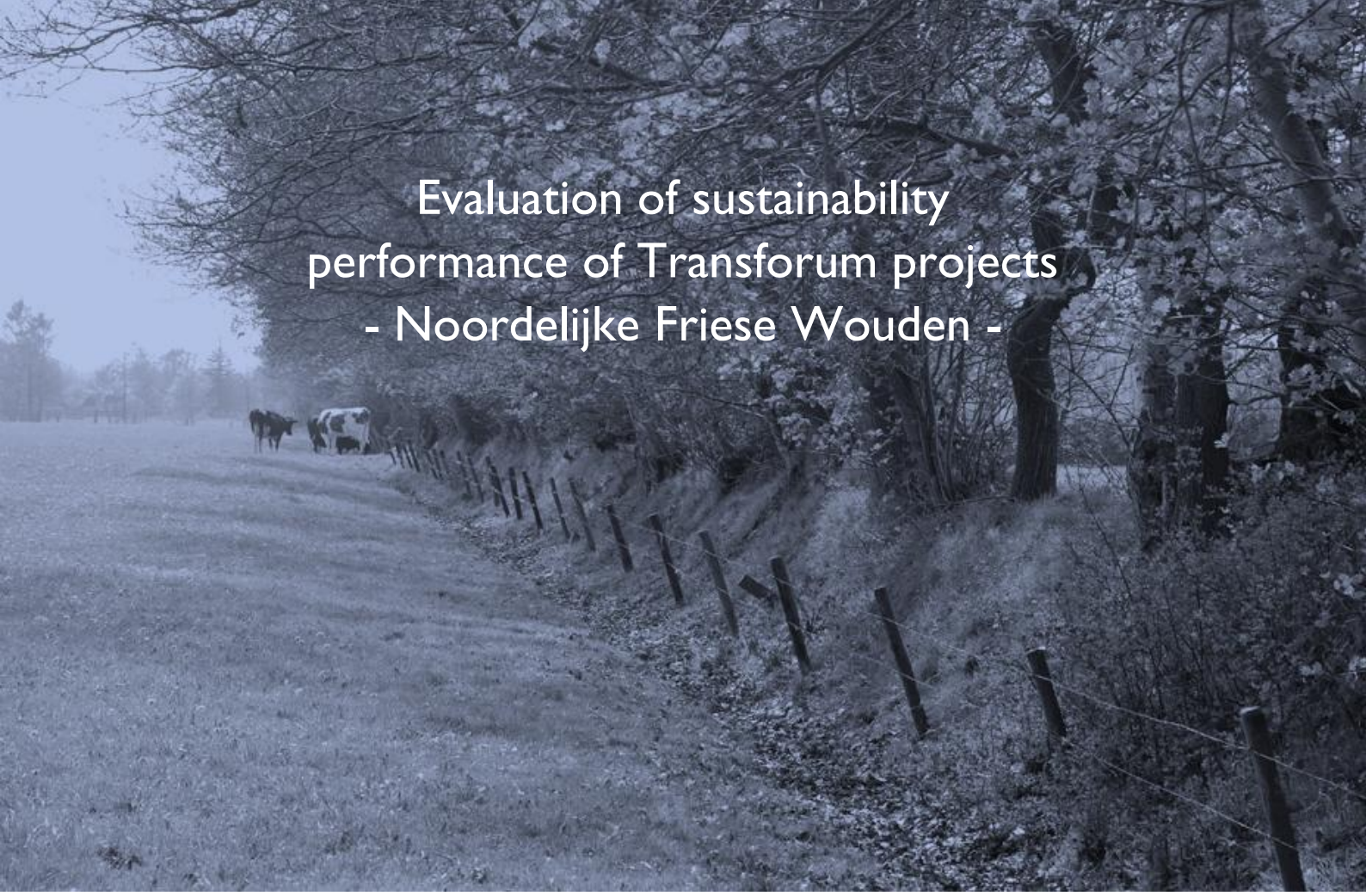

Evaluation of sustainability performance of Transforum projects - Noordelijke Friese Wouden -

Anton Kool

Sander van der Flier

June 2010

BLONK | MILIEUADVIES
giving shape to sustainability

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Contents

1. Introduction

1.1 Sustainability mapping approach

This document evaluates the sustainability performance of the TransForum project "Noordelijke Friese Wouden " (or Northern Frisian Woodlands and also referred as: *the initiative* or NFW*)* according to the approach that is described by Blonk et al. (2010).

A full description of the approach that is used to evaluate the sustainability performance of TransForum projects can be found in the methodology report by Blonk et al. (2010). A short introduction to the applied methodology is described in chapter 2.

Paragraph 1.2 gives a short description of the TransForum project "Noordelijke Friese Wouden". Chapter 3 describes which baseline scenario is used to determine the sustainability performance of Noordelijke Friese Wouden. Chapter 4 evaluates the total sustainability performance of Noordelijke Friese Wouden. Chapter 5 closes with the discussion and conclusions.

1.2 The initiative: Noordelijke Friese Wouden

The Noordelijke Friese Wouden is a rural region in the north-eastern part of the province of Fryslân (Figure 1.1) with a high cultural, historical and natural value. The landscape in this region is unique for the Netherlands because its diversity and relatively well preserved cultural historical structures like hedgerows (Bouma et al. 2008; Compendium voor de Leefomgeving 2009, Slabbers et al., 2009). Since 2005 the NFW is one of the national landscapes of the Netherlands.

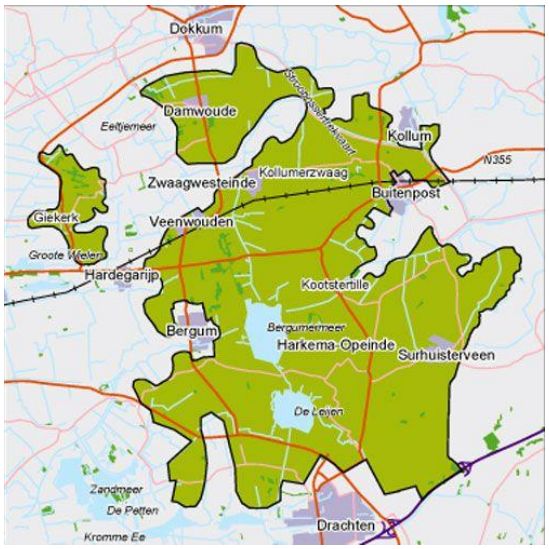


Figure 1.1 Area of the Noordelijke Friese Wouden

Farmers in the region united in the association NFW to stimulate both protection and development of the cultural-historical and natural landscape values and economic (mainly agriculture) development in the region (Noardlike Fryske Wâlden, 2010)

The initiative which is subject for this sustainability assessment can be divided in five parts. First part is the general consciousness and convince that the region needs protection and sustainable development

which is most prominently shown in the association Noardlike Fryske Wâlden. The other parts are more specific cases or projects[1] which are under development in the NFW:

1. Alternative strategy ('Alternatief Spoor' of 'kringlooplandbouw'): aims to comply with legal standards concerning environmental emissions by changes in mineral management (ammonia nitrate), excluding obligatory non-desirable measurements like low emission manure application (see also VBBM, 2010). In 2010 a (second[2]) trial started in the region NFW to research the potential of this strategy. Main aspects of this strategy are reducing nitrogen content in roughage and in manure (managed by urea count in milk), reducing nitrogen fertilizer use and above ground spreading of manure. To guarantee these measurements a certification scheme is under development: 'Woudencertificaat'.
2. Energy from wood. The aim of this part of the project is a centralisation of pruning the hedgerows and processing (cutting and or drying) the wood . The wood is burned in stoves or is sold to civilians.
3. Region branding. This is a project to promote a wide variety of products from the region (recreation, holiday, agro products like milk, cheese) and also the region itself by using one brand.
4. Large scale farming in a small scale landscape. The purpose of this concept-in-development is that growth of farms can be combined with improving the quality of landscape, for instance by compensation of lost hedgerows or introducing new animal species in the area. Important aspects are autonomous decision processes in the region guided by a commission formed of representative actors in the region (agro entrepreneurs, NGO's, politics) and each case is judged separately, instead of central supervision and general rules.

1.3 System definition: Added value through integration

The different projects in the region NFW supervised by the association Noardlike Fryske Wâlden and the association itself are connected in many different ways. The total initiative of the cooperation and the individual projects add (potential) an economic and sustainable value to the area. The cooperation does not provide new products . New products are provided by the projects stimulated by the cooperation. The connections formed by the cooperation between multiple projects, entrepreneurs and actors is so complex that the whole system can be seen as one initiative.

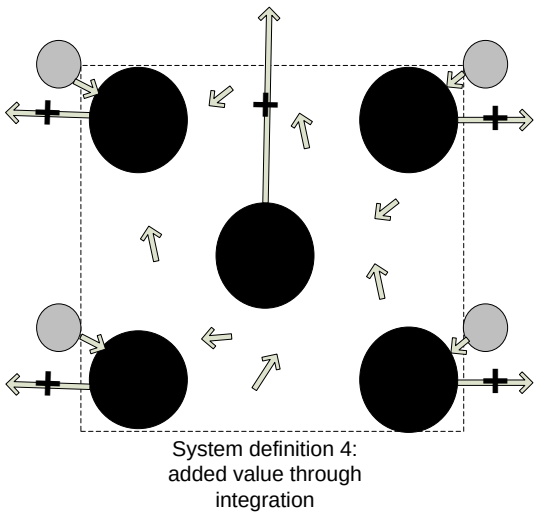


Figure 2.2 System definition of Noordelijke Friese Wouden as described in Blonk et al. (2010)

[1] Or so called 'product-market-combinations' (PMC's)

[2] The results of the first trial are described in Sonneveld et al. (2009). In this second trial the potential of the alternative strategy is tested for 2 years on 1250 ha in NFW and 1250 ha on other locations in the Netherlands.

2. Methodology

This chapter gives a brief overview of the methodology used to evaluate the sustainability performance of initiatives. More information about this methodology can be found in Blonk et al. (2010).

2.1 Evaluating initiatives on sustainable performance

Sustainability is a very broad concept dealing with ecological, social and economic consequences of our actions. Absolute sustainability doesn't exist or at least very hard to define. A more workable concept is sustainable development which implies that we are able to define more sustainable directions and thus be able to measure a more sustainable performance. Sustainable development includes nature and environmental aspects (planet), social aspects (people) and economic aspects (profit). It refers to a an ongoing process of finding balance between these aspects.

It is often not easy to evaluate the performance at a glance because the implications of an initiative do often not result in an improvement on all different sustainability aspects. Moreover there are many effects and actors involved on different locations and with different timeframes.

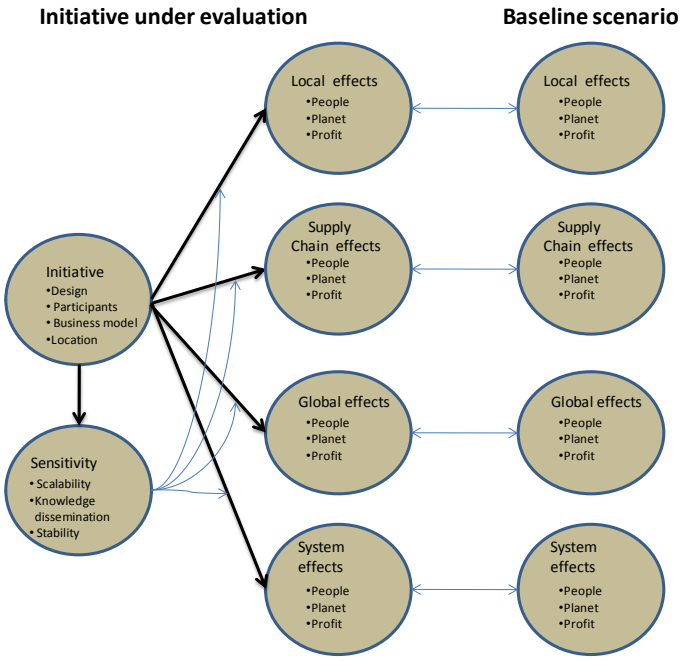


Figure 2.1. Outline of applied evaluation methodology

For evaluating the TransForum initiatives a specific evaluation methodology needed to be developed because existing methods do not cover the total spectrum of effects related to a new initiative. Each initiative generates people, planet and profit effects for different actors and different scales These effects are divided in this methodology in local effects at the initiative, local effects in the supply chain, global effects, and system effects. The ultimate impact of an initiative is also the result of the resilience of the deigns, the potential for upscaling and the knowledge spreading mechanisms involved. Scoring the sustainability performance is only possible in relation to a baseline scenario (figure 2.1).

Our method for measuring sustainable development performance of initiatives is based on a combination of three existing approaches of :

- Lifecycle assessment (Guinee, 2002)(ISO14040, 2006)(ISO 14044, 2006) (ILCD 2010) (SLCA guide 2009)
- Environmental Impact Assessment *(a.o. EU directive 85/337/EEC amended in 1997)*
- Supply chain and company Reporting of Sustainability (Global Reporting Initiative)(ISO 14064, 2006) (Poverty footprint of Oxfam Novib draft 2010)

LCA methodology gives the framework for making a sound evaluation of environmental and (partly) societal impacts over a production chain of products and gives directions how to evaluate the consequences of changes or improvements in lifecycles. EIA methodology is primarily involved with local effects and provides different working methods for evaluating a combination of qualitative and

quantitative information. Furthermore a sound definition of the baseline and alternative scenario's is one of the most important aspects of EIA. A third approach can be qualified as reporting sustainable performance of companies and their supply chain. The Global Reporting Initiative and the poverty footprint methodology of Oxfam Novib set the framework. All these basic methodologies are under continuous development which means that our sustainability mapping methodology is also

The evaluation is preferable carried out in a iterative and interactive way, using a sequence of five steps per round:

1. Define the initiative.
2. Define the baseline scenario.
3. Score local, supply chain, global and system effects.
4. Visualize the scores within the sustainability map *(for an example see figure 4.1)*.
5. Evaluate the results of the evaluation with the main stakeholders.

These steps are explained in the next paragraphs.

2.2 Defining the initiative

Before an initiative can be evaluated on sustainability a clear understanding of the initiative is needed. Which parties are involved? What are the boundaries of the initiative? What are the sustainability propositions (aims)? What's the location of the initiative? Some initiatives must be defined further to come to a business case that can be evaluated. This can be the case when an initiative is still in a preliminary stage of design.

2.3 Defining the baseline scenario

To evaluate the sustainability of an initiative it is necessary to define a baseline scenario. The baseline scenario differs for each initiative and is based on the business as usual for the initiative and the participants. Leading question is what would have been the situation, in a couple of years, if the initiative does not take place?

There are several types of developments relevant for defining the baseline scenario:

- What would the entrepreneurs do if the initiative does not take place?
- What would happen at the location if the initiative does not take place?
- What happens to other locations because of the initiative?
- How would the (environmental) performance of the product autonomous develop if the initiative does not take place?

Which developments are important to include and to what extent depends on the initiative. Sometimes the local aspects are very important and sometimes it is a minor issue.

2.4 Definition of effect categories

This paragraph briefly describes the different sustainability aspects (3P's) with the corresponding sustainability indicators of local, supply chain, global and system effects. A description of all sustainability indicators, and how these indicators are scored, can be found in Blonk et al. (2010).

2.4.1 Local effects of the initiative

Local effects are divided into scales: The first scale is the initiative. The second scale is a regional scale, referring to the surroundings of the initiative. Sometimes a third scale is involved, for instance a national scale when specific themes are interrelated with national governance. Regional and national scales are

relative terms and depends on the type and extension of each specific initiative. These scales have to be defined for each individual initiative.

Initiative
A part of the effects of the initiative are located within the physical borders of the initiative. On the initiative scale there are people, planet and profit effects defined:

- People effects for employees, entrepreneurs and animals (e.g. work conditions and animal welfare).
- Planet effects at the initiative site (e.g. landscape, physical environmental quality and biodiversity)
- Profit effects of the initiative (e.g. balance, investment costs and value creation).

Regional
An initiative also influences the direct surroundings and can have people, planet and profit effects on a regional scale. It can affect residents, companies or employees nearby the initiative. People effects are for example changes in opportunities for recreation and community involvement towards the initiative. Planet effects are related to physical or chemical emissions to the surroundings and changes in landscape and biodiversity. Profit effects on a regional scale are considered as a positive contribution to the community.

National (when appropriate)
For some of the local effects it is necessary to take the national perspective into account. On national scale planet effects are important because they have a strong national dimension based on regulations (e.g. regulations on eutrophication). People and profit effects are not evaluated on a national scale because of difficulties in making these effects operational unambiguously.

2.4.2 Local supply chain effects

Besides local effects at the site of the initiative an initiative can also have comparable local effects at the supplying companies. This can be initiated by selective sourcing, setting sustainability criteria for suppliers, developing sustainability improvements with suppliers, etc. The same thematic framework is used as a starting point for evaluating local effects in the supply chain.

In some cases local effects of downstream business (customers) need to be included in the evaluation, for instance in case of forwarded chain integrations.

2.4.3 Global effects of the product(s) of the initiative

A specific category of effects are those effects not depending on the location of operation and/or emissions. These effects include some specific planet effects and major environmental themes like global warming and land use.

The global effects which are scored are:

- Land use. This indicator is related to land conversion, loss of biodiversity, increasing greenhouse gas emissions, increasing competition between agro functions such as food, bio-based materials and biofuels.
- Climate change.
- Depletion of fossil resources, such as use of fossil fuels and phosphate rock.

These global effects are determined on product level so upstream and downstream processes are also included in the calculations. It must be noted that changes in quality or quantity of land do also have an impact on social or economic viability. The effects on local changes in land quality are evaluated under local people effects of the initiative or the supply chain.

2.4.4 System effects

An initiative ultimately generates products or services that may have an impact on other systems related to the usage of the product. For instance the usage of LED lamps reduces costs of energy of the consumer while at the same time it will reduce the environmental impact per unit light and per unit money.

A change in environmental impact (planet effect) per expended unit money (eco-efficiency) is relevant from a sustainable consumption perspective. A consumer can only use its money once and it is assumed that a lower impact per euro is better. A change in the amount of money expended per function is relevant for determining rebound effects related to the change in costs and behavioural adaptations. System effects of products related to health and improving knowledge of agricultural and/or sustainable production are also scored.

2.4.5 Potential of the initiative

The potential of an initiative refers to the scalability, stability and spreading of knowledge of an initiative. A first question to be answered is whether it is possible for an initiative to be copied at other locations and by other entrepreneurs or is it a one time operation or a specific niche market? The main question to be answered for evaluating "*Spreading of knowledge*" is whether the initiative aims to spread knowledge and/or includes mechanisms to do so?

2.4.6 Critical success factors

Finally, the evaluation gives information on specific parameters in the design or the surroundings of the initiative which are determinant for the realization and up scaling potential. These critical success factors give the actor(s) involved with the initiative essential information on risks and opportunities and can be used for strengthening the design or defining the conditions for (further) investments and making the initiative operational.

2.5 Visualizing the effect scores: "mapping of sustainability performance"

To make interpretation of the results easier we developed two visualizations.

1. A dashboard where the effects are categorized along the following qualification:
    - positive in relation to the baseline scenario
    - neutral in relation to the baseline scenario
    - negative in relation to the baseline scenario
    - not relevant for this initiative
    - relevant, but lack of data

2. A circle diagram which shows the relative amount of scoring positive, neutral, negative or relevant but lack of data.

3. Description of the baseline scenario

In general the baseline scenario is characterized by the trend in the Netherlands of increasing scale of farms, both in intensivity (milk produced per ha and per cow) and in size of the farm (in ha's or in number of animals). In the baseline there is a lack of involvement of the (agricultural) entrepreneurs and citizens with the region and its unique features. In the baseline an association like NFW does not exist.
Concerning maintenance of landscape elements the national legislation is taken as a baseline. For agriculture nature reservation (for instance pasture birds) the conditions of national policy are the reference.

For the different projects specific aspects can be mentioned concerning the baseline.

Alternative strategy:
NFW is focused on reducing the use of fertilizers, improving the quality of the soil and perhaps even improving the quality of the milk produced. This is done in a twofold way by changing the way and number of times the soils are fertilized with animal manure and changing the composition of the feed for the animals.
In the baseline the fertilizing meets the Dutch standards: low emission application, two times a year (animal manure) , amount of N-fertilizer equals the legal standard or is a bit less etc. The farmer is less focussed on reducing nitrogen in roughage, but is mainly focussed on yield per ha.

Energy from wood:
Part of the project is focused on creating energy from wood. In the NFW there are a lot of alder girths and hedgerows which provide wood.
In the baseline it is assumed that the recent method will prevail: Many different administrative organizations and farmers are responsible for pruning specific areas and there is no overall strategy what to do with this wood. The pruning is used as firewood on a small scale .

Region branding.
For the region branding we assume that in the baseline no activity as such is being implemented. So no activities to promote the region are initiated.

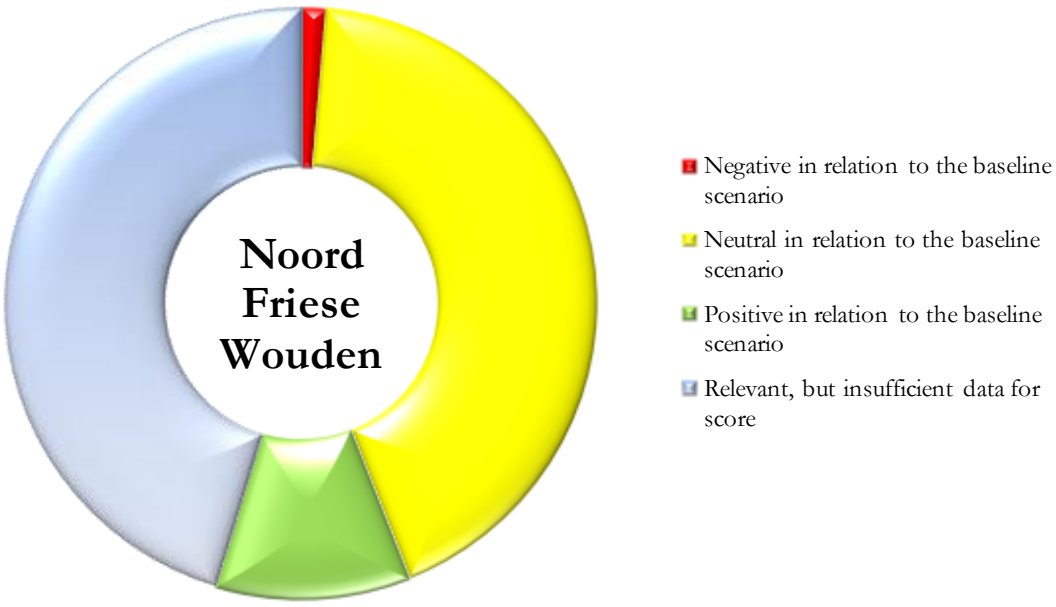
Large scale farming in a small scale landscape
The autonomy of the actors in the region to decide for each case what could be the best strategy to keep balance between development on farm level on the one hand and preservation and strengthening of the landscape on the other hand is not relevant for the baseline. In the baseline general rules are applied making that development of farms is being hampered and extra strengthening of the landscape is missing

4. Sustainability of Noordelijke Friese Wouden

In this chapter the sustainability of NFW is evaluated through a top-down design. In paragraph 4.1 an overall figure, the sustainability map, is shown which is assembled out of a more comprehensive table, the sustainability table, from paragraph 4.2 This sustainability table contains 50 scored sustainability indicators and the critical success factors which are evaluated for the 'association NFW' and the four separate projects: 'Alternative strategy', 'Energy from wood', 'Region branding' and 'Large scale farming'. In figure 4.1 the separate impacts for those five parts of NFW are summed in one total figure. The arguing of the scored sustainability indicators is described in paragraphs 4.3 till 4.7. The critical success factors are described in paragraph 4.8.

4.1 Sustainability map

Figure 4.1 shows the sustainability map for the NFW in total (sum of impact from five parts: the association Noardlike Fryske Wâlden, 'Alternative strategy', 'Energy from wood', 'Region branding' and 'Large scale farming') compared to the baseline scenario as described in chapter 3. A comprehensive description of all scored sustainability indicators per part of NFW can be found in the following paragraph of this chapter. Figure 4.1 is assembled out of the relevant sustainability indicators per part of NFW from table 4.1. A weighing of importance of each indicator has not been applied.



Critical succes factors
- Exemption or change in legislation
- Autonome decision process in the region
- Value creation

Figure 4.1. Sustainability map of NFW (summation of impacts on indicators for the five separate parts of NFW)

Figure 4.2 is assembled out of the relevant sustainability indicators from table 4.1. A weighting of importance of each indicator has not been applied.

A red score can refer to many different situations of which three are of special importance:

- Red (negative) for economic indicators of the initiative (column 4)
- Red for global planet indicators (column 3)
- Red for system effects (column 3)

If the green scored area in the donut is relatively low, one may wonder if the initiative must be qualified as a sustainability initiative. It depends, however, greatly on what the relative weight of the green area is. A well thought initiative is aware of these hot spots of sensitive sustainability issues. The relative contribution of the "grey area" (relevant, but not enough information) gives information about the extent of issues that could not be evaluated. In this area there may be possible threats as well as opportunities. (For further explanation see Blonk et al. 2010).

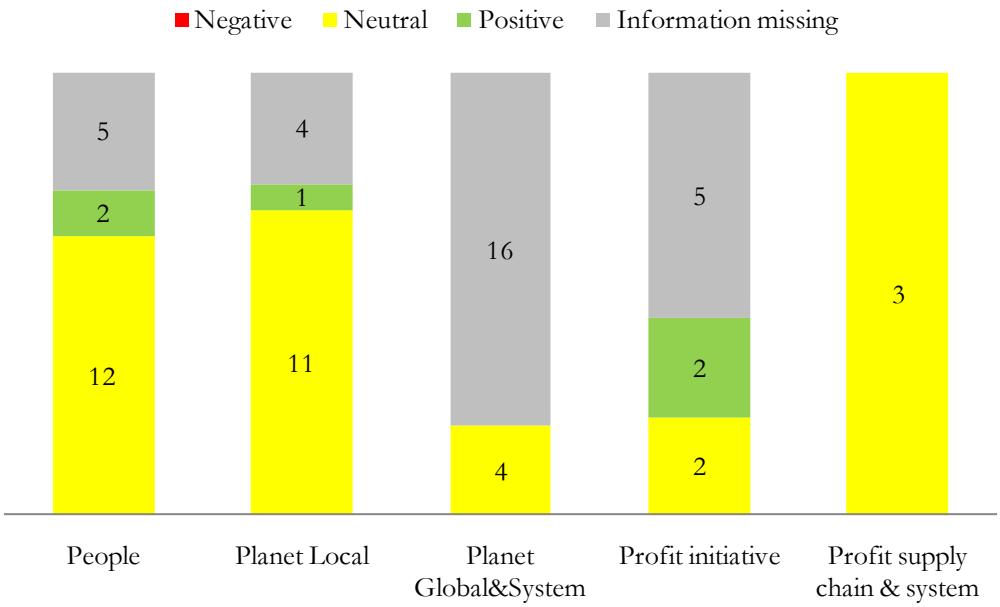


Figure 4.2. Sustainability profile of NFW

4.2 Sustainability table

Table 4.1 shows the sustainability map for each separate part of NFW (the 'association NFW' and the four separate projects: 'Alternative strategy', 'Energy from wood', 'Region branding' and 'Large scale farming') compared to the baseline scenario as described in chapter 3. A detailed explanation about this format and why these sustainability indicators were chosen can be found in the methodology report (Blonk et al., 2010). The arguing of the scored sustainability indicators for each separate part is described in paragraphs 4.3 till 4.7. If an indicator is not relevant for a specific part no explanation is given. The critical success factors are described in paragraph 4.8.

Table 4.1. Sustainability table of NFW, divided ito five parts: the association Noardlike Fryske Wâlden and the four separate projects: 'Alternative strategy', 'Energy from wood', 'Region branding' and 'Large scale farming'

1 .Local impacts of the production system

		Indicator	Initiative: asso-ciation NFW	Initiative: alter-native strategy	Initiative: energy from wood	Initiative: region branding	Initiative: large scale farming	Supply chain
People	In Company	1.01 Human rights						Yellow
		1.02 Labor conditions						Yellow
		1.03 Animal welfare & health		Green			Yellow	Yellow
	Community negative	1.04 Human health (other than emissions)		Yellow	Yellow		Yellow	Yellow
		1.05 Animal disease risks		Yellow			Yellow	Yellow
	Community positive	1.06 Development	Grey			Grey		Yellow
		1.07 Involvement	Grey			Grey	Grey	
Planet	In Company	1.08 Environmental quality		Yellow			Yellow	Yellow
		1.09 Biodiversity		Grey	Grey		Grey	Yellow
		1.10 Landscape			Yellow		Green	Yellow
		1.11a Emissions affecting ecosystems and human health to air:NH3		Grey			Yellow	Yellow
		1.11b Emissions affecting ecosystems and human health to water NO3		Yellow			Yellow	Yellow
	Surroundings	1.12 Environmental quality						
		1.13 Biodiversity						
		1.14 Landscape						
Profit		1.15 Balance sheet		Green	Grey		Green	Yellow
		1.16 Investment		Grey	Grey		Yellow	Yellow
		1.17 Value creation		Grey	Grey	Grey	Yellow	Yellow

2. Global (non local) impacts of the product per functional unit

	Indicator	asso-ciation NFW	alter-native strategy	energy from wood	region branding	large scale farming
Planet	2.01 Land use		Grey			Yellow
	2.02 Greenhouse gas effect		Grey	Grey		Grey
	2.03 Depletion: fossil energy use		Grey	Grey		Grey
	2.04 Depletion: phosphate rock		Grey			Yellow

3. Functional (system) effects related to product consumption and use

	Indicator	asso-ciation NFW	alter-native strategy	energy from wood	region branding	large scale farming
People	3.01 Health		Green			
	3.02 Other welfare aspects (individual)					
	3.03 Welfare and involvment community					
Planet	3.04 Land use		Grey			Yellow
	3.05 Greenhouse gas effect		Grey	Grey		Grey
	3.06 Depletion: fossil energy use		Grey	Grey		Grey
	3.07 Depletion: phosphate rock		Grey			Yellow
Profit	3.08 Money budget					
	3.09 Time budget					
	3.10 Prosperity community					

4. Potential of initiative

Indicator	asso-ciation NFW	alter-native strategy	energy from wood	region branding	large scale farming
Upscaling potential	Grey	Red	Grey	Green	Grey
Knowledge dissemination	Green			Green	

Legend

Colour	Meaning
Green	**Positive** in relation to the baseline scenario
Yellow	**Neutral** in relation to the baseline scenario
Red	**Negative** in relation to the baseline scenario
White	**Not relevant** to the initiative
Grey	Relevant, but **insufficient data** to score

5. Critical succes factors

1. Exemption or change in legislation
2. Autonome decision proces in the region
3. Value creation

4.3 Local impacts of production chain - initiative

This paragraph describes the local sustainability indicators 1.01 till 1.17 of the initiative which are scored in Table 4.1. Sustainability indicators which were not relevant (blanc in table 4.1) are not addressed.

1.03 Animal welfare and health

Part of the 'alternative strategy' is the obligatory stay in the pasture for the dairy cows. This will be certified in the 'Woudencertificaat'. Access to the pasture is positive concerning animal welfare compared to stay in the animal house. In the baseline an increasing amount of dairy cows does not have access to the pasture (16% in 2006 in Northern Netherlands (Van Well & Van der Schans, 2008)).

1.04 Human health (other than through emission)

No difference is expected for this indicator for the projects 'alternative strategy', 'energy from wood' and 'Large scale farming' although the indicator is relevant..

1.05 Animal disease risk

The animal disease risks at the dairy farms of the NFW projects 'alternative strategy' and 'Large scale farming' will not differ from the baseline.

1.06 Development

The full range of activities organized by the 'association NFW' including the 'region branding' could be a stimulus for development. For example if recreation grows the municipality is more willing to invest in roads or public transport. Because not enough information is available on this topic this indicator is marked as grey. Nevertheless this can be seen as an opportunity (see also chapter 5 conclusions).

1.07 Involvement

At the recent stage of development of the different projects citizens and other stakeholders are invited as much as possible to participate into the management of the projects. Especially in the management of the 'region branding' there is a relatively high share of non-farmers participants. In contrast to the baseline in both the 'association NFW' and the separate projects there is a pro active attitude to involve citizens. Despite this attitude is found positive there is not enough information to score this indicator positive. Nevertheless the involvement of the community can be seen as an opportunity (see also chapter 5 conclusions).

1.08 Environmental quality

The evaluation of this indicator for 'alternative strategy' and 'large scale farming' is focused on soil quality, one of the main reasons to argue for spreading of manure at the soil surface in stead of below the soil surface.

The theory is that by the use of heavy machinery the soil structure is compressed and the injection of manure in the ground damages the soil fauna.

Comprehensive research on several aspects of alternative strategy farming in 2005 and 2007 also focused on the effects on soil fauna and structure (Sonneveld et al., 2009). The results of this research shows that there is no difference in compression of the upper layer in the soil (upper 20 cm) on grassland at farms applying manure above soil surface and farms applying manure with a low emission technique (below soil surface). There is no difference between those farms neither in soil density nor in pore volume (Sonneveld et al., 2009).

Other research confirms these results. De Haan et al. (2009) explain that the harmful consequences of the first applied machinery for low emission application at the first 1990's are solved by the recent modern

available technologies (using less deep injection or spreading between the grass and using variable tire pressure).
In conclusion we expect no difference for this indicator for the project 'alternative strategy'. For the project 'large scale farming' it can be argued that this development will lead to bigger machinery. Nevertheless based on De Haan et al. (2009) we presume no direct thread for soil quality due to the use of modern equipped material.

1.09 Biodiversity

Soil life

It is assumed by NFW that spreading manure above soil surface is less harmful to soil living organisms than using low emission techniques where soil organisms are exposed to high levels of ammonia and the soil structure may be damaged. Manure injection also introduces harmful elements like sulfur hydrogen gas to the soil which could reduce the oxygen content of the soil. A reduced oxygen content could be favorable for harmful bacteria and fungi (VBBM 2010). Research however, suggested that there is no differences in the number of worms[3] and nematodes between farms applying manure above ground and farm applying manure with low emission techniques (Sonneveld et al., 2009). The researchers however remarked that no conclusions can be drawn because of the small amount of participating farms and because there is only one measurement one year after the start of above soil surface spreading manure.
De Haan et al. (2009) describes several results of recent studies that have been carried out on the effect of manure application on soil quality and the abundance of worms[3] . From these studies it can be concluded that both above soil surface spreading and low emission application of manure may negatively influence soil life. (De Haan et al, 2009). These negative effects are not different using low emission techniques or the above soil surface application of manure. De Haan et al (2009) concluded that more specific research on the relations between soil life, application and manure is needed to draw conclusions on this topic.

Pasture birds

Modern agriculture is a direct threat to pasture birds (De Haan et al, 2009). Grazing cattle, manure application and mowing can be harmful for nests and kill young birds . Early in the season and large scale (big area at once) mowing is the biggest threat for hatching the chicks. The chicks can be killed by the mowing but also the natural coverage and forage disappears. De Haan et al. (2009) states that the moment of manure application is of more importance than the specific technique. Postponing the moment of manure application and mowing will have a positive effect on the hatching. Part of the 'Alternative strategy' is using roughage which is harvested on a later date to reduce nitrogen content. This might have a positive by effect on the hatching of pasture birds. But for now not enough information is available to evaluate that specific topic.

Nature in hedgerows

The flora and fauna in the hedgerows is of big value for nature and biodiversity. The effect of the different projects on this biodiversity is not known. Improvement of the hedgerows in the project 'large scale farming in small scale landscape' may be positive, but sufficient information is lacking

Conclusion

In general there is not enough information available to evaluate the indicator biodiversity for the relevant projects 'alternative strategy', energy from wood' and 'lare scale farming'.

1.10 Landscape

Recently a political vision on the landscape in the NFWis written (Slabbers et. al, 2009). The goal of this vision was to investigate how development in agriculture can join preservation and reinforcement of the

[3] Worms play a crucial role in the cycle of feedstuff in soil and agriculture and in the soil structure. Worms convert organic nitrogen into mineral nitrogen which becomes available for up take by plants. On grassland worms can convert as much as 85 kg to 170 kg per year per ha organic nitrogen into mineral nitrogen. Therefore the number of worms is an important indicator for soil quality.

landscape. The study shows that agricultural development is possible without degradation of landscape. In addition, it can improve the landscape when the right conditions are set.
The project 'large scale farming is mainly based on this outcome: agricultural development within the scope of preservation and reinforcement of the landscape, coordinated by local representatives.
The broad representative of actors in a commission and the case specific approach of landscape matters concerning Agricultural development is being evaluated as positive. Although concrete results or information is not available at this moment, this evaluation is made because compared to the baseline this a positive approach to improve landscape

1.11a Emissions affecting ecosystems and human health in company
Because the initiative NFW covers a large area the indicator emissions is mainly relevant for 'in company', the area covered by the NFW.

a) Ammonia, NH3
Sonneveld et al. (2009) describes the results of a comprehensive research of ammonia emission on farms applying the alternative strategy and traditional farms. Research resulted in emission factors of 21, 31 and 58% for above soil surface manure application for three periods of measurements in 2007. For low emission application the emission factors for the same periods where resp. 16, 19 en 21%. The emission factors for above soil surface manure application appeared equal to the lower range of factors given by literature (28-100%). Therefore, Sonnveld et al. (2009) concluded that the Alternative strategy reduces ammonia emission.
From these results Sonneveld et al (2009) determine an emission factor of 35% for above soil surface manure application and 16% and 26% for the two different low emission techniques: 'zodenbemesting' en 'sleepvoetbemesting'. Using these emission factors and farm management specifics (cows per ha, milk production per animal) the ammonia emission per ton product (milk) and per ha is calculated. Ammonia emission is larger per ton product and smaller per ha for the alternative strategy compared to the reference farms (Table 4.2). Nevertheless the ammonia emission varies a lot within the group of farms using the alterative strategy. Some of the farms using the alterative strategy realize a comparable ammonia emission as the reference farms, indicating that the alternative strategy (including above soil surface manure application) can result in comparable emissions as the current management on dairy farms (Sonneveld et al ,2009). The reaction from VBBM (2010) at these results is that many of the alternative strategy farms did not have applied the strategy properly. If the strategy would have been followed properly emissions would have been lower (VBBM, 2010).
The reduced emission per ha for the alternative strategy farms is because of the lower intensivity (milk production per ha). In relation to NFW as a region the emission per ha can be of more importance than the emission per unit product. The emissions per ha determine the impact on nature and environment.

Tabel 4.2 The ammonia emission for dairy farms applying the alternative strategy compared to conventional dairy farms , based on Sonneveld et al (2009).

	Kg NH3 per ton milk	Kg NH3 per ha
Alternative strategy	8.0	73
reference	6.8	86

The above described results do not give a decisive answer about the ammonia reduction potential of the 'Alternative strategy'. Therefore this indicator is marked as grey. For the project 'large scale farming' no differences in ammonia emissions are expected.

b) Nitrate, NO3

Sonneveld et al. (2009) also researched nitrate concentrations in the groundwater on alternative strategy and reference farms. The results show that for both group of farms the average nitrate concentration is below the EU-legislation level of 50 mg/L. The average concentration is 13 mg/L and 14 mg/L for resp. reference farms and alternative strategy farms (corrected value due to one excessive high measurement). In both groups 9 to 10% of the measurements are above the EU legislation level. It can be concluded that there is no difference between farms using the 'alternative strategy' and reference farms.

Also for the project 'large scaled farming' we do not expect any difference in nitrate leaching because manure management is not expected to differ with the baseline.

1.15 Balance sheet

The balance for farms applying the 'alternative strategy' and is expected to be positive. This is also the case for 'large scale farming'.

Concerning 'energy from wood' not enough information is available.

1.16 Investment

For farms applying the 'alternative strategy' we expect that investment costs are reduced compared to farms in the baseline because less expensive machinery has to be bought for manure application. On the other hand this is only one aspect. More aspects in management are changing which can affect investments. No complete insight is available at this moment. Also for 'energy from wood' there is not enough information for evaluation. For 'large scale farming' we expect no changes in investment costs compared to the base line.

1.17 Value creation

The projects 'alternative strategy', 'energy from wood' and 'region branding' aims at different scale at value creation. Uncertain is to what extent value creation will be realized. Therefore this indicator is marked grey for these projects. For 'large scale farming' there is no difference in value creation compared to the baseline.

4.4 Local impacts of production chain – Supply chain

The most relevant supply chain is, apart from the different projects, compound feed for dairy cows. Concerning the initiative NFW no conditions on sustainability aspects (environment, social, economic) of production are set for the production of feed. This means that all relevant indicators (1.01 to 1.06, 1.08 to 1.11 and 1.15 to 1.17) are evaluated as equal compared to the baseline.

4.5 Global Effects

This paragraph describes the global sustainability indicators 2.01 till 2.04 which are scored in Table 4.1. The global sustainability indicators (land use, greenhouse gasses and fossil energy) are evaluated from feed production until retail. These indicators are only relevant for the projects 'alternative strategy', energy from wood' and 'lare scale farming'.

2.01 Land use

Land use on global scale is mainly determined by the use of compound feed. The change in amount of compound feed used per unit product in the project 'Alternative strategy' can not be evaluated because

information is lacking about changes in feed use. For 'large scale farming' we expect no changes in feed use compared to the baseline.

2.02 Greenhouse gas effect

The 'alternative strategy' has both greenhouse gas reducing and GHG increasing effects. The above soil surface manure application reduces the nitrogen oxide (N2O) emissions. The nitrogen emission as N2O is 1% of the applied nitrogen with above soil surface manure spreading, whereas the nitrogen emission as N2O is 2% if the manure is applied with low emission techniques. On an average dairy farm this will give a reduction of 4-5% on the total greenhouse gas emissions. Worth mentioning is that these emission factors of 1% and 2% do have a high degree of uncertainty. The application with lighter machinery will reduce energy use (fuel consumption) but this effect is negligible (0,02% on farm level).
The reduction of the use of nitrogen fertilizer will also reduce greenhouse gas emissions. A reduction with 50 kg N per ha will reduce the total greenhouse gas emissions on farm level with 4%.
Another aspect of the alternative strategy is feeding older roughage containing less protein. The quality of roughage will directly influence fermentation processes in the rumen and thereby influences methane emissions. Grass harvested on a later date will contain in general more cellulose and less sugar, the components which mainly affect the methane production (the more cellulose the higher the methane production). Methane emission from rumen fermentation is about 40% of the total greenhouse gas emissions on a dairy farm, so a change in this emission will have a relatively high impact on total emissions on farm level.
There is not enough information how emissions from different sources will be affected due to changes in the 'Alternative strategy' and how these individual changes will be weighed together.

At the project 'energy from wood' energy from renewable sources (wood) is used. Compared to the baseline the use is more structured (central collecting and sale) but uncertain is whether and to what extent fossil energy is replaced which reduces greenhouse gas emissions. Additionally the central collecting and sale of pruned wood needs transport (fossil fuel) and pruned wood may first be dried in the grass dry processing plant. The latter will result in extra (fossil) energy use and greenhouse gas emissions.

For the 'large scale farming' it can be expected that efficiency in production is increased which may reduce energy use and greenhouse gas emissions. Not enough information is available to evaluate this indicator for this project.

2.03 Depletion: fossil energy use

The evaluation for this indicator is comparable to the indicator 'greenhouse gas effect'. For the 'Alternative strategy' pro's and con's can be mentioned concerning energy use. To total overview on the effect on energy use is missing. For the project 'energy from wood' the uncertainty is the possible difference in producing and using renewable energy and the possible extra energy use for drying the pruned wood.

2.04 Depletion: phosphate rock

The efficiency of phosphate used in dairy farming is mainly influenced by feed intake and manure management. Concerning feed intake not enough information is available for 'alternative strategy'. Concerning phosphate efficiency in animal manure no difference is expected between 'alternative strategy' and the baseline. For 'large scale farming' no difference is expected on this indicator.

4.6 System effects

This paragraph describes the sustainability indicators (the system effects) 3.04 till 3.07 which are scored in table 4.1. Sustainability indicators which are not relevant (blanc in table 4.1)are not addressed.

3.01 Health

Milk produced in NFW has a higher content of CLA's (unsatisfied fatty acid with positive effects on human health) than the average milk produced in the Netherlands (Elgersma, 2006 and Elgersma 2009). This is caused by the relatively high amount of grazing. In the 'alternative strategy' grazing is an obligatory measurement (registered in the "Weidencertificaat'). In contrast to the baseline where an increasing amount of dairy cows does not have access to the pasture (16% in 2006 in Northern Netherlands (Van Well & Van der Schans, 2008)). With the obligatory grazing in the 'alternative strategy' a certain level of CLA's is guaranteed in milk and thereby has a positive effect on the health of the consumer. This is positively evaluated compared to the baseline.

3.04 Land use to 3.07 depletion: phosphate rock

The ranking on these indicator depends on the ranking of the indicators 2.01 to 2.04 combined with price information. For the projects 'alternative strategy' and 'energy from wood' no information is available about prices. For 'large scale farming' we assume equal prices as the baseline resulting in comparable rankings as in 2.01 to 2.04 for this project.

4.7 Potential

Upscaling potential

In general the initiative to organize activities and communicate is also possible in other regions. Unavoidable is the involvement and motivation of stakeholders (farmers, residents) to start such an initiative. They must have tied relationship with the region and also feel a sort 'sense of urgency'. These aspects are not present everywhere.

The 'alternative strategy' is not unique for NFW. Some other dairy farms spread across the Netherlands are also applying this method (VBBM, 2010). Nevertheless the scalability is evaluated negative because for the aspect of above soil surface manure spreading a chance of the national legislation is needed. Ahead of the possible (positive) result of the current trial it is evaluated that the scalability is negative. If the trial results in a change in national legislation that under conditions (for instance guaranteed by a certificate) above soil surface manure spreading is allowed than the negative score for scalability will change into neutral.

The projects 'energy from wood' and 'large scale farming' are still under development and for now there is not enough information to evaluate the scalability. For the 'large scale farming' an important question is in what degree the coordinating commission will have space to act..

Knowledge dissemination

In general a lot of effort is put into knowledge spreading (for instance website of the initiative www.noordelijkefriesewouden.nu). Important part of the region branding is communication and knowledge spreading. Because the degree of knowledge spreading is more than in the baseline this indicator is marked positive for the 'association NFW' and 'region branding'

4.8 Critical success factors

Exemption or change in legislation

National legislation prohibits the above soil surface manure spreading desired in the 'Alternative strategy'. The potential of this project depends on the developments concerning this legislation. A possibility is that an exemption under the condition of certification will be possible.

Autonomous decision process in the region

For several projects and developments a main aspect is the autonomy of the actors in NFW. A key success factor is to what extent this autonomy can be managed successfully. Questions like 'What are the instruments available to correct people or organizations etc' are relevant.

Value creation

One of the goals for each project (or product market combination) is to create a new product or more value for the same product. This value cration is essential to compensate decreasing income from dairy farming on the relatively small dairy farms in NFW.

5. Discussion and conclusions

To interpret the conclusions on the sustainability performance of Noordelijke Friese Wouden in this study the following has to be taken into account. This study evaluates the sustainability performance of the initiative Noordelijke Friese Wouden divided in four effects (local, supply chain, global and system effects), based on the methodology that is described in Blonk et al. (2010). Within this differentiation different sustainability indicators, which are ordered in the three categories people planet and profit, are evaluated. The total evaluation of the sustainability performance depends on each sustainability indicator and the importance (relative weight) of each indicator. A weighting of importance of each indicator has not been applied in this study.

The results of this study are based on the intentions and plans of different projects in Noordelijke Friese Wouden. If the implementation deviates from those intentions, this could have consequences for the sustainability performance evaluation. This can have either positive or negative effects on the final evaluation. If such deviations from the original plan and intentions occur, this needs to be evaluated before conclusions can be drawn about sustainability.

Strengths

- Tied relationship and involvement of farmers and residents with the region and its unique features. As a result the willingness to put a lot of effort into initiatives that contributes to the development of the region;
- Especially the project 'large scale farming in small scaled landscape' does have the potential to preserve and reinforce the unique features of the landscape in NFW together with development in agriculture.

Weaknesses

- The above ground application of manure in the project 'Alternative strategy' is not legal. Currently it is only temporarily allowed for a number of dairy farms joining a trial. A permanent permission needs a change in legislation.

Opportunities

- All the projects organized by NFW will stimulate (economic) activity in the region which may lead to an increase in development;
- At NFW there is a pro active attitude to involve citizens at projects. This may lead to a bigger involvement of citizens.
- The milk from NFW containing a relatively high share of CLA's can be sold as a health promoting product.

Threat

- A possible threat for NFW is the economic difficult circumstances for farmers and declining amount of farms. The unique landscape in NFW depends on agricultural activity. If that economic activity is under pressure it will have consequences for the unique features of the region.

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