CASE STUDY

SKYLARK (NETHERLANDS)

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1 Introduction: What is the case study about?

This case study focuses on the Skylark foundation: an organisation that unites arable farmers, food processors and stakeholders in the supply chain to stimulate a joint effort to improve sustainable arable farming. In total 388 arable farmers are member of the foundation, managing over 45.000 ha (8,7%) of arable land in the Netherlands (Annual report 2015). An individual sustainability plan is the core element used by Skylark members in realising and communicating sustainable arable farming. Unlike what the name seems to suggest, Skylark does not specifically focus on the conservation of the skylark, but rather on sustainable land management. In summary, the Skylark approach is interesting as governance arrangement, and as private initiative it is relevant in the search for innovative governance arrangements. Interesting features of the approach are the focus on intrinsic motivation, tailor-made sustainability plans, social learning among farmers, the involvement of food processing industry, and the attempts to get recognition for the farmers' sustainability efforts in CAP greening.

Table 1: Overview of case study

Region or locality	Netherlands (Skylark Foundation) with embedded case of Midden Brabant group in area of De Dommel Water board.
Main Farming/ forestry system	Skylark: arable farming. De Dommel area: arable farming, intensive cattle breeding, forestry, nature reserves.
Area (ha) of initiative (& Case Study)	De Dommel area is 150,000 ha; Skylark Midden Brabant farmers manage 1,900 ha
Key ESBOs covered	Water quality, water quantity, soil health.
Total no. of farmers/ foresters involved	Netherlands: 388 Skylark participants. Midden Brabant group: 9 farmers (2016).
Other key stakeholders involved	Netherlands: supply chain companies, consultancies, Ministry of Economic Affairs. Midden Brabant group: De Dommel Water board
Source(s) of funding	Skylark meetings and activities: private, including the farmers. Specific projects: sometimes public.
Start date of initiative	2002
End date of initiative	Ongoing

As the organisation is rather large and sub-divided into regional farmers' groups, the Pegasus case study focuses on a regional group in Midden Brabant, between the cities of Eindhoven and Tilburg in the south of the Netherlands (Figure 1). This group consists of 9 arable farmers (2016). They have mostly large-scale farms, are not organic, and one of them is a front-runner farmer practising precision agriculture. This case study focuses on the ESBO's soil and water because of the interests of this regional farmers group.

The case study region, the working area of De Dommel Water board, covers approximately one fourth of the Province of Noord-Brabant. The 9 farmers of the Midden Brabant Skylark group together represent approximately 1,900 ha (including land outside the Dommel area, interview 2) and the area of the Dommel Water board is app. 150,000 ha (www.dedommel.nl).

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The case study region is a predominantly small-scale landscape on sandy soils, in which farmland is intersected by forests, small nature reserves and creeks. Because of the main interests of the group, we focus in the case study on water and soil related benefits. Because of the sandy soils, drought is an issue in summer, but in lower parts peek water can be problematic. As a result mainly of intensive farming practices, water quality is poor, as critical loads of nitrogen deposition are structurally exceeded. Water quality and quantity are related to soil management and farmers acknowledge this relation (interviews 2,3,4). According to group members, raising soil organic matter is a main issue in relation to soil fertility and soil moisture (interview 3,4). Based on the interviews and the ESBO's of soil and water we identified the regional Water board *De Dommel* as main governmental stakeholder.

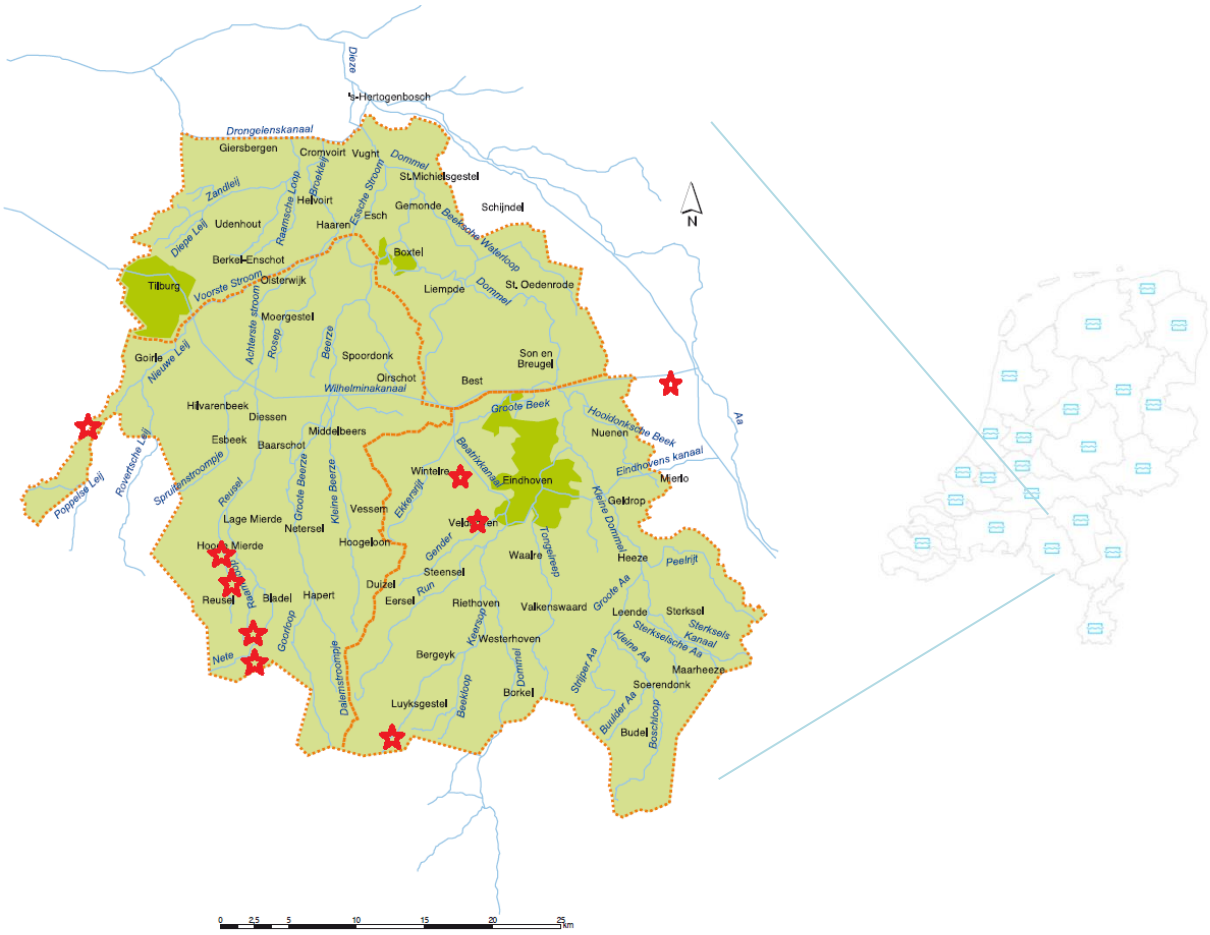

Figure 1: Location of farms participating in the Skylark Midden Brabant group and the working area of De Dommel Water board
(Source: www.waterschappen.nl, www.dommel.nl, interview 2).

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2 Definition of the social-ecological system (SES) studied

2.1 Figure of the SES, using the revised SES Framework

CASE STUDY: Skylark

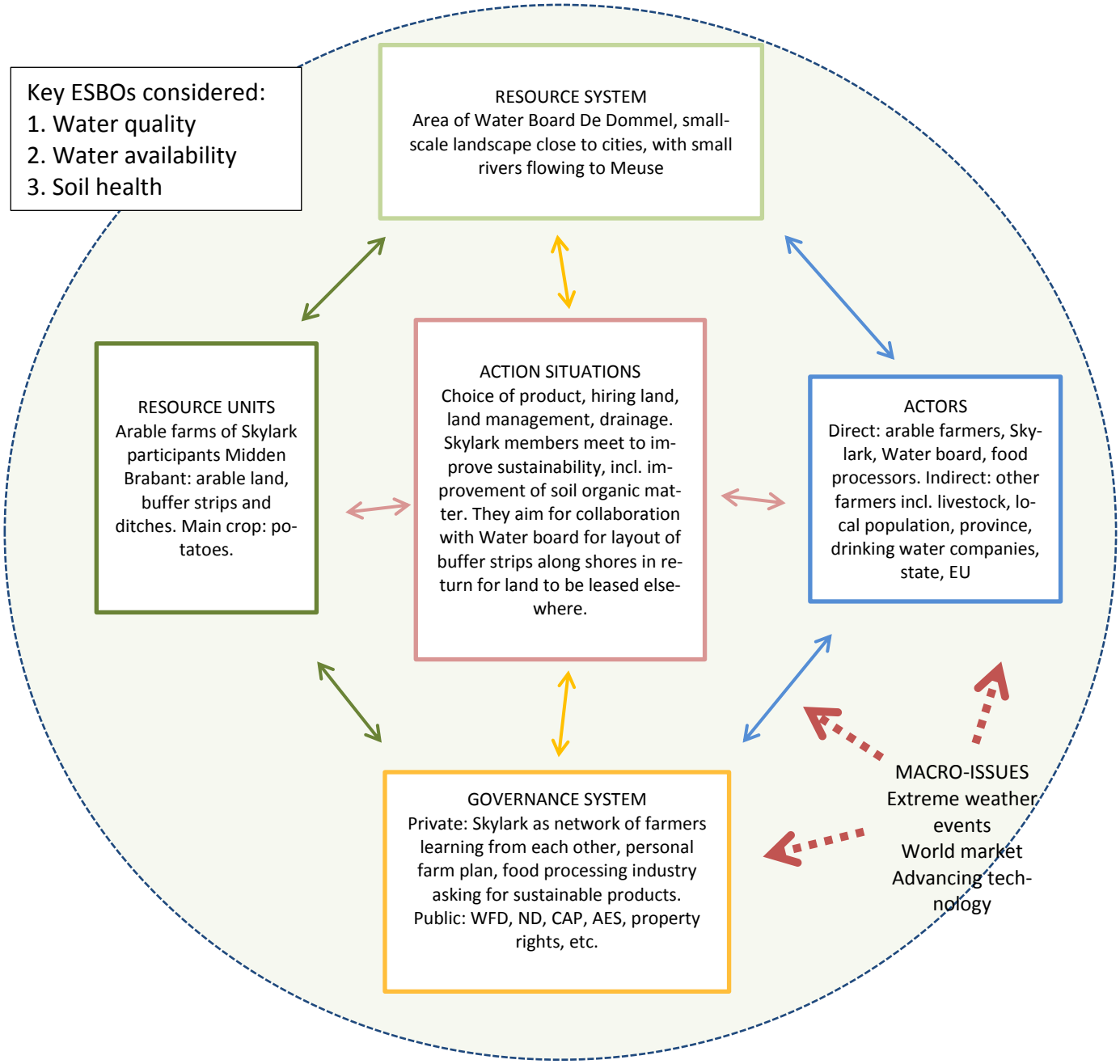

Figure 3
Summary of the SES framework for Skylark case study
(adapted from Ostrom and Cox 2010; McGinniss and Ostrom 2014)

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2.2 Description of the SES

2.2.1 Social, economic and political settings

On a national level there is a decrease of area under arable production and number of arable farms (see Annex 9.2). At the same time, the average size of farms is increasing as well as land prices. Farm incomes slowly rise, but fluctuate. Payments from agri-environmental-climate schemes (AECS) contribute approximately 1% to farm income on an average arable farm (www.agrimatie.nl), while direct income support constitutes 47% of the farmers' income. Between 2004 and 2014, the number of arable farms in the Province of Noord-Brabant diminished with 37%, while other farming systems in Brabant decreased with 22% in the same period. Main crops are potatoes, cereals and root crops (CBS).

The most important crop in the case study area is potatoes. Other crops are mainly grown for rotation purposes, including unions, carrots and maize. All Skylark participants in this group sell the largest share of their production to traders and food processing companies (such as Rijko, Ardo, Farm Frites) and not to local markets. This is a result of the sandy soils (narrowing down for instance the type and quality of potatoes) and the large size of the farms (limiting the options for local marketing: local markets are considered too small) (interviews 2,3,4).

According to the interviewees expansion of farms in the case study is a result of some farmers not having successors while others take over the holdings of the ones that suspend (interview 2, 3, 4). Interviewees relate this to the extent to which farmers have been able to invest in modernisation and enlargement. Farms that are too small and old fashioned are considered not attractive to the new generation: another barrier is the high amount of office work that is nowadays part of the job (interview 3, 4, notes of meeting). All participating farmers have personnel (interview 3). There is no notable movement of new entrants: because of the high costs of starting a farm, new entrants normally appear in urban agriculture or nature-oriented farming (based on leasing low-cost low-productive land in nature reserves).

In the case study region arable farming has increasingly become a high-tech operation. All participating farmers use advanced machinery and technology for cultivation, irrigation, harvesting and storage. The farmers use technology to combine more sustainable practices with lower costs. One of the participants is a front runner in precision agriculture, collecting all kinds of data about the land and the crop[1]. He saves on his pesticide costs by counting bugs in the field and adapting the dose to the subarea in the field as well as to the weather forecast (interview 4). Another farmer has a subsoil system to transport water from a wet area on his farm to a dry area during winter: this saves him the costs of at least one time irrigation in summer (interview 3).

[1] See http://www.farmhack.nl/resultaten-farmhack-1-datavisualisatie-pieperboer/ for a report of a hackaton based on his data

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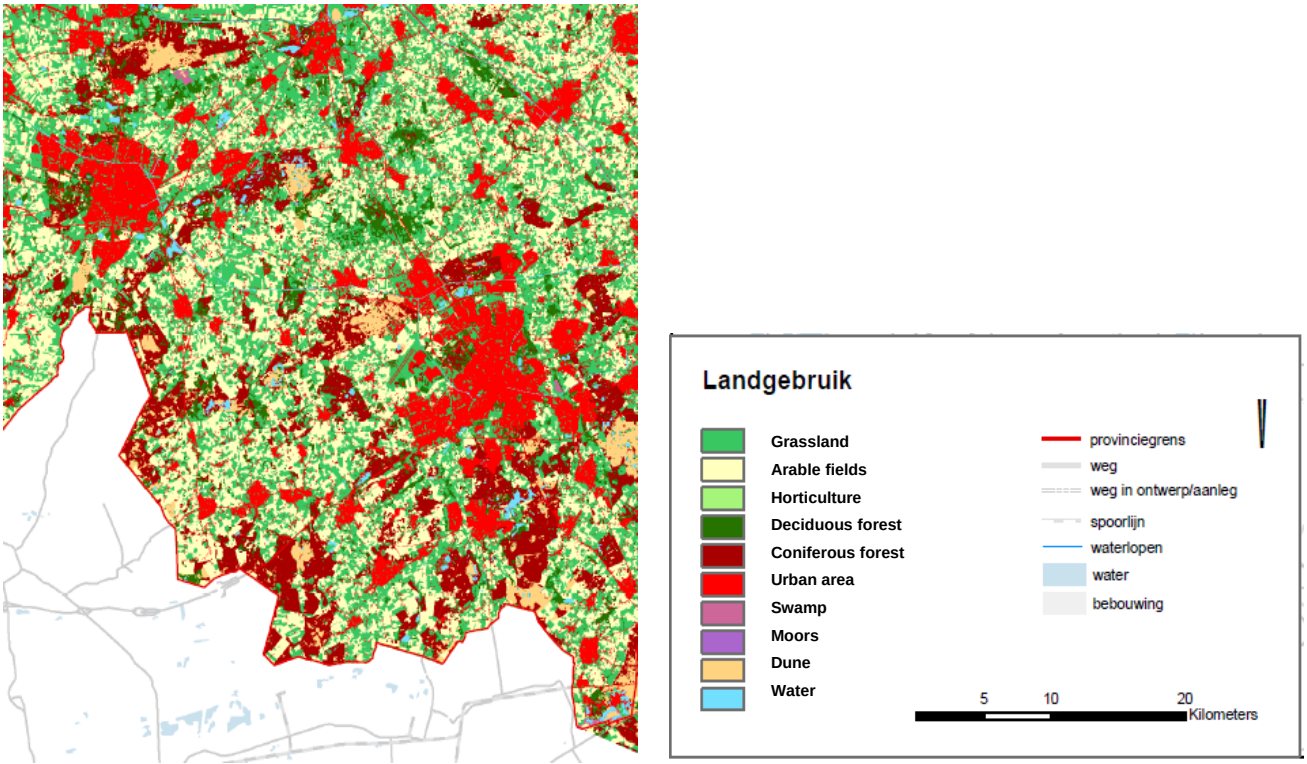

Figure 2: Land use.
Source: Province of Brabant

2.2.2 Resource systems and resource units

Skylark regional networks consist of arable farms that are scattered across a region. The case study region also has other types of farms, such as livestock farms. Arable fields are intersected with ditches that are part of the water system. The ditches drain to creeks and creeks to rivers. The water levels and flows at farm level are managed through a sophisticated system of ditches, sluices, and sometimes drains. At regional/ watershed level the water is managed by means of canals, dikes, sluices etc. Water systems are delineated as governance area: Water boards cover watersheds. However, creeks flow from Belgium to the Netherlands and the rivers from the case study Water board area flow into the river Meuse. The farmers manage the ditches, but the Water board has set rules about irrigation and the maintenance of ditches. The Water board maintains the larger water ways. The area has several zones where groundwater is protected for drinking water production, this is a provincial responsibility (Figure 3). In water that is currently collected, traces of pesticides are found dating back 25 years (interview 3).

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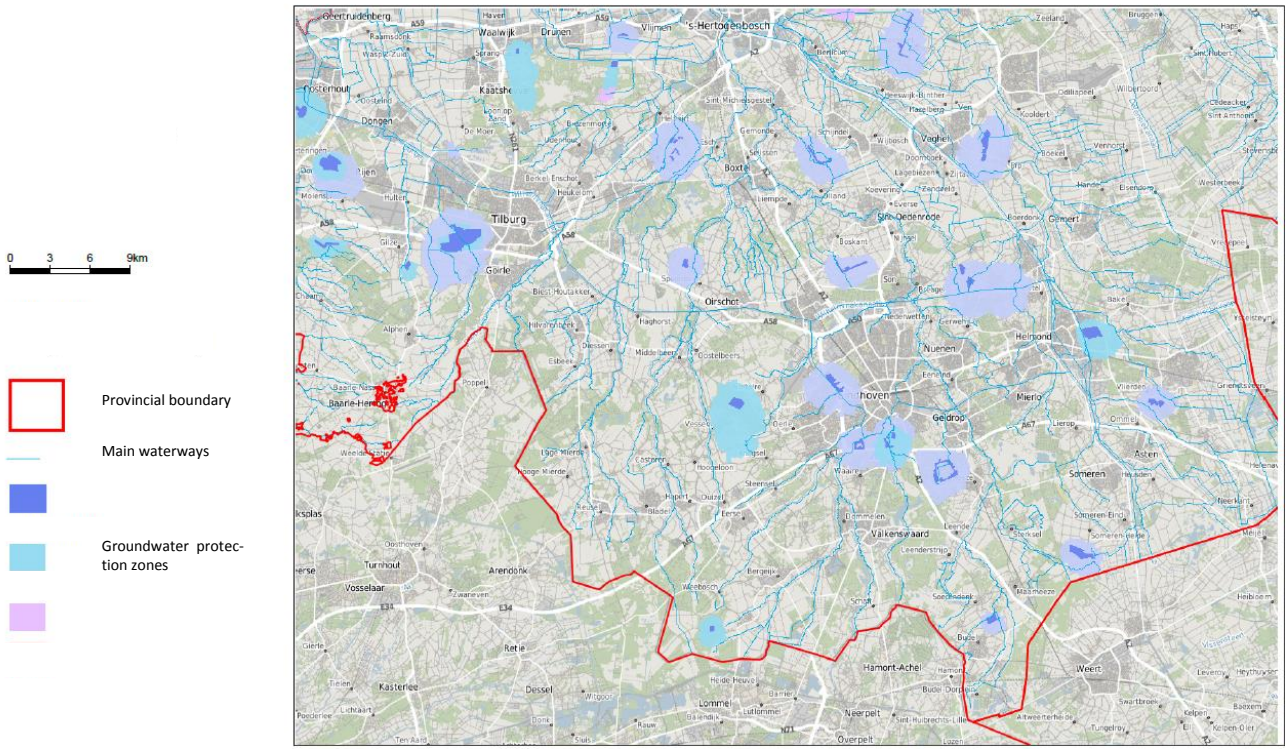

Figure 3: Ground water protection zones for drinking water intake.
Source: Provincie Noord-Brabant.

This region used to be farmed by small-scale mixed farms. Because of the poor sandy soils, large areas were covered by heather. When artificial fertilizer came available, most heather fields were converted to farmland: both for arable production and for keeping livestock. In the period after WWII, many creeks and small rivers were canalized to improve drainage and to save space. Eventually, most farms in this region specialized as arable farm, dairy farm or intensive livestock farm. Most dairy and other livestock farms still own land where feed is harvested (mainly grass and maize). However, most livestock farms currently keep more animals than they can feed from the own land and much feed is imported. As a result, the amount of manure has become a problem. For arable farmers, on the other hand, it is very easy to get animal manure in the neighbourhood. Since manure policy has become more strict, farmers complain that they cannot apply the amounts that the crops require (interview 3). Land prices are high, as a result the arable farming practices are quite intensive.

The sandy soils drain well. In summer, farmers need to irrigate their crops. In case of extreme droughts, irrigation is prohibited, but normally farmers are allowed to irrigate. However, with heavy rains, excess water can also be a problem (Figure 4). In June 2016, large areas in the South of the Netherlands flooded as a result of heavy rains and high water levels in the rivers. As a result, many farmers lost their crops and the water board for months was very busy handling claims, because in many cases the insurances did not cover the income foregone of the farmers.

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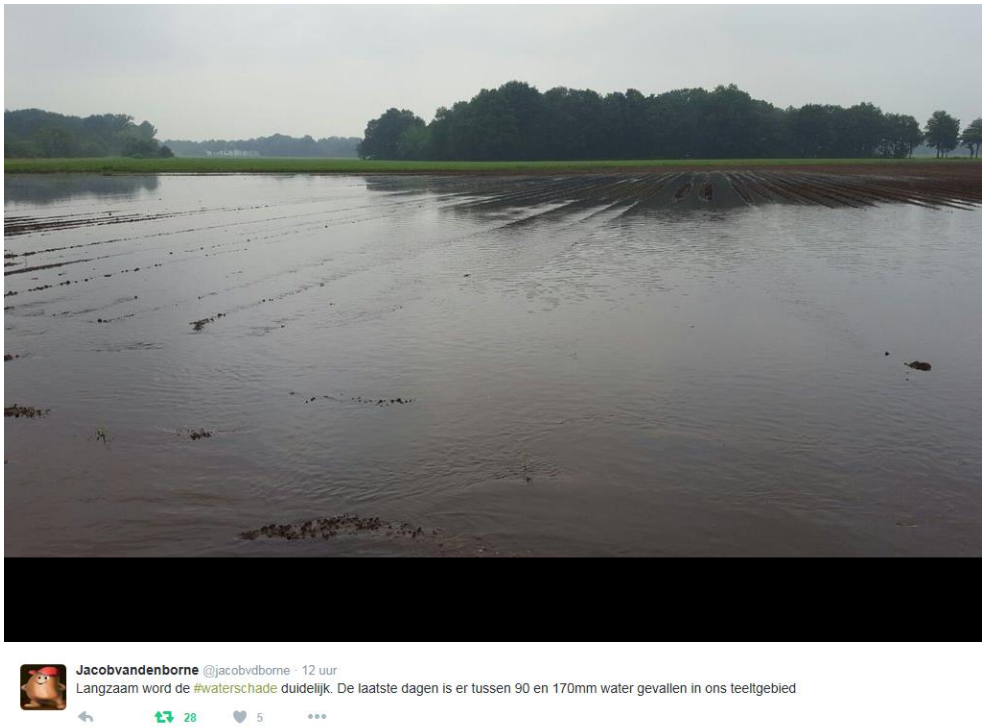

Figure 4: 2 June 2016: fields of participants of Skylark group Midden-Brabant have flooded as a result of heavy rains and high water levels in rivers.

The case study area of De Dommel consists of a relatively small-scale landscape with forests, swamps, heather, arable fields, grasslands, ditches and creeks, villages and cities. In potential, it is an area rich in biodiversity. However, on the whole, biodiversity is in decline and especially the farmland species (Heunks et al., 2009). Of the farmland target species, only badger and barn owl are improving. In general, the target species with an upward trend are associated with swamps and heather, in which habitats much has been invested in the last decades. The case study area has a population of target species of arable fields, including the Skylark, which was observed by one of the authors.

2.2.3 Related ecosystems

Small rivers such as the Dommel flow into the area from Belgium. There have been projects for improving water quality at the other side of the border as well[2]. The quality of the water flowing into the Netherlands has improved (interview 5). However, there seems to be little cooperation between the water authorities Waterschap De Dommel (NL) and Watering De Dommelvallei (BE). From the area of Water board De Dommel, the water flows into the area of Aa en Maas near the city of 's Hertogenbosch, where it flows into the Meuse river. There is coordination between the two Water Boards and Rijkswaterstaat, the national agency that manages the main rivers, to prevent that too much water is added to the Meuse at once (interview 5). In summer, care is taken that not too little water flows into the Meuse to maintain enough depth for ships (interview 4). Further downstream, outside the case study area, Meuse water is harvested for drinking water for the inhabitants of Rotterdam region. In effect, the

2 http://www.interactiefwaterbeheer.eu/beekrandenbeheer-in-het-stroomgebied-van-dommel-en-warmbeek/

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drinking water companies downstream have no influence on the land management in the case study area. However, also in the case study area, drinking water is harvested and the Province has designated ground water protection areas (see also 2.3 and Figure 3).

Another link to higher levels of scale is through feed imports. Arable farmers in the CS area retrieve the animal manure locally, but livestock farmers import much feeds from abroad, including soy. As a result, the area has an excess of animal manure. Because of environmental regulations (see 2.2.4), part of this must be brought to other areas, at the cost of the livestock farmers.

2.2.4 Actors and governance systems

Governmental actors and main instruments
Relevant governmental actors, their main instruments and their impact at farm level are summarized in Table 2, as far as relevant to arable farming and the ESBO's of soil and water.

Table 2: Governmental actors and instruments relevant to arable farmers in CS area

Tier of government	Main instruments for agri-environmental issues	Impact at farm level
EU	CAP 1st pillar Cross-compliance. Greening	Greening measures have in general little impact at farm level as most arable farmers comply with the Ecological Focus Area measure by sowing catch crops after the main crop, a practice that does not interfere a lot into the conventional practice. As for the crop diversification measure, farmers generally do comply without any effort as the measures does not imply additional requirements to the conventional practice.
	CAP 2nd pillar	Some arable farmers participate in AES, and RDP provides for subsidies for precision agriculture, see province
	Nitrates Directive	Limit to amount of animal manure, above which artificial fertilizer still can be applied. This discourages use of animal manure and compost.
	Crop protection rules	Limited choice of products and rules for application.
	Water Framework Directive	Indirectly through Water board policies
	Bird and Habitat Directives	Stricter rules for farms surrounding Nature 2000 reserves (see State)
State	Meststoffenwet (manure act, based on Nitrates Directive)	The amount of N that can be applied depends on soil type, crop and derogation. Arable farms are constrained in hiring land from livestock farmers because of manure rights. Crop residues cannot be applied as mulch on other farms.
	Programmatic Nitrates Approach (PAS)	Extra rules for farms and industries in the vicinity of Nature 2000 areas.
	Tax reduction	Tax reduction is possible for constructing environmental friendly installations.

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Tier of government	Main instruments for agri-environmental issues	Impact at farm level
	Research funding	Some farmers participate in state-funded research projects on farming practices and innovation.
	Plant disease regulations	Seed potatoes need to originate from the own farm or be certified and can only be planted at the own farm.
	Management of main river discharge i.r.t. climate adaptation	Indirect, through agreed amounts of water that can be discharged from smaller rivers into main rivers by water boards.
Province	Spatial planning	General rules for farm locations, including minimum distance to inhabited area for livestock farms
	Nature policy	Designation of nature reserves and supervision of management. Enforcement of rules for farms in buffer zones.
	AES (part of RDP)	The AES in the Netherlands is aimed at measures to enhance biodiversity and/ or water quality. Main measure for arable farmers is buffer strips (> 25 - 150 cm baseline [3]).
	RDP (based on 2nd pillar CAP)	The RDP includes a subsidy for acquiring instruments and machines for precision agriculture. Water board aims to use RDP subsidy for knowledge dissemination on soil and water.
	Ground water quality (including related to the harvesting of drinking water, see Figure 3)	Designation of ground water protection areas
Water board	Regulations for water quality	Water board monitors surface water quality and sanctions farmers who do not comply with the rules.
	Management of water levels/ water quantity (keur)	Permits are needed for watering in summer. Farmers depend on water boards for sufficient drainage. Farmers are obliged to manage depth of ditches.
	Subsidies for buffer strips	Sometimes integrated with RDP and AES
Municipality	Spatial planning: zoning plans and building permits	Life is easier for arable farmers than for livestock farmers

Farmers have to comply with EU and national environmental legislation. The recent Dutch manure act has made the rules more strict also for arable farmers (interviews 2,3). Policies for landscape and nature management are however made by the Provinces. Also the national Agri-Environment Scheme (AES) is implemented by the province. The AES include options for laying out buffer strips: the first 25-150 cm are mandatory along all waterways, the additional hectares of wider buffer strips can be subsidized. While the main rivers and their dikes and coastal defence are a national matter, the Water boards are responsible for water quality and water quantity issues in the regional watersheds and thus for implementing the EU Water

[3] Depending on crop and application technique. Intensive crops such as potatoes: 150 cm. Grains 25 cm.

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Framework Directive in their area. Water boards are public authorities with democratically elected representatives. They are traditionally close to the agricultural sector because the water levels that they set, determine possibilities for production. Most Water boards have subsidy schemes for farmers to enhance water quality and to compensate farmers in designated areas for occasional flooding (storm water storage). Water boards are also involved in restoring canalised creeks into their more natural profile, often in collaboration with the Province and nature organisations. Municipalities are responsible for spatial planning, together with the Province. Intensive livestock farmers have been involved in fierce discussions in this densely populated area when they opted for building 'mega-stables' and had to apply for building permits. Compliance with rules is controlled by means of sampling by a range of public officials, notably those from AID, NVWA and Water board.

Land ownership and tenure

Because arable farmers prefer to specialise, land is exchanged among farmers to enable crop rotation in order to prevent the development of diseases in the soil. Arable farmers spend most of the winter period 'talking around', trying to arrange land for next growing season. Sometimes this is arranged through a formal lease contract, but often this is an oral agreement (interview 3, 4). Also land of livestock farmers is included in this rotation. As a result, there is very little permanent grassland in the area. The farmers complain that their attempts to manage the soil sustainably with crop rotation are hindered by regulation: because of national rules for the prevention of plant diseases, seed potatoes cannot be grown on land of others; and land that is leased out by livestock farmers can no longer be counted in the manure administration (interview 3, 4, notes of meeting). Because of this, and because of income support being linked to land use rights, arable farmers often work the land of livestock farmers without a lease contract and sell the produce to the livestock farmer (interview 2). Farmers are concerned about land changing managers all the time: not all colleagues take good care of the land so it is wise to sample the soil before hiring it (interview 2, 3, 4).

The innovative governance arrangements represented and proposed by Skylark Foundation are described in section 4.2.

Other actors

Other relevant actors in the region are drinking water company Brabant Water, other farmers in the area (non-Skylark participants, mainly arable and livestock farmers), agri-environmental cooperatives, nature conservation organisations (owners of most nature reserves) and large water consuming companies such as Coca Cola and Bavaria brewery. Much regional environmental policy development is done in networks of governmental and non-governmental actors. An example is the plan 'Conscious Brabant' (Brabant BEWUST) of farmers union ZLTO, the four water boards, the province, and sector organisation Cumela. The plan is aimed at extension and capacity building of farmers. Another example is 'Clean Water for Brabant' (Schoon Water voor Brabant) of de province, drinking water company Brabant Water, ZLTO, agri-environmental group Duinboeren and the water boards. This project (since 2010) aims to reduce the use of pesticides/ herbicides to protect groundwater.

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2.2.5 Action situations

Buffer strips are seen by the Water board as an effective measure to improve water quality (interview 5), although the farmers criticize that buffer strips in their opinion are not laid out at the most vulnerable locations (notes of meeting). The level of the public payment is considered appropriate, but farmers do not like to lose production space. In spite of research supporting the multiple value of bufferstrips in the Dutch situation (Bos et al, 2014), sometimes even commissioned by the Skylark Foundation (Alebeek, 2015), most farmers of this Skylark group do not see added value to use the buffer strips also for biodiversity (it is unlikely that the research reports have reached these farmers). They question the effectiveness of natural pest control and even mention adverse effects (notes of meeting). The precision farmer does see added value: to enhance natural pest control and to improve relations with citizens (interview 4). However, buffer strips are less likely to be implemented on land that is only hired for one year. See section 4.2.3 for the proposition of the Skylark MB group about how to enhance water quality.

Raising soil organic matter is seen as a key measure both by farmers and by the Water board. The farmers expect that raising organic matter will result in a better soil structure, and therefore less stagnant water on the land. The soil will hold the water better, so they hope to save on irrigation. Also, they expect the soil to be more fertile and able to absorb fertilizer better, reducing emissions. Raising soil organic matter is, according to the farmers, currently limited by legislation about the application of fertilizer and by the practice of rotating land between farmers. Possibly, it is also limited by farmers' knowledge and by the crop varieties used. For instance, according to one farmer, the current variety of maize was developed in a period when much manure could be applied, and now requires much manure to grow well (interview 3). In addition, farmers seem to prefer chemical fertilizer over animal manure and animal manure over compost. The limited 'space for manure application' as a result of legislation is then filled with animal manure and chemical fertilizer and only few farmers use compost.

The Water board is increasingly interested in soil issues because of the relation with water quality and quantity (interview 5). The Water board tries to find farmers who want to use the biomass resulting from maintenance of Water board owned water ways and shores. It would keep the biomass in the area and could improve soil organic matter (interview 5). However, farmers are reluctant because of the legal limits to the application of manure (interview 3). In addition, the water board views water policy often in combination with nature policy. Projects to restore natural river beds and integrated area plans are coordinated by the province (interview 5).

2.3 Levels of ESBO provision, trends and determinants

For decades, much animal manure has been applied to the land in the case study area: this has enriched the soil but nowadays it is too high in phosphate and too poor in soil biodiversity (interview 4).

The water quality in the waterways of the region is in unfavourable condition: in the waterways that are monitored in relation to the Water Framework directive, the quality ranges from

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'moderate' to 'bad' (Figure 5). The objectives of the Nitrates Directive are not reached (interview 5). The Dutch State of the Environment (PBL 2016) states that specifically in this part of the Netherlands (the southern sandy soils) the mean nitrogen concentration in groundwater is considerably exceeds the maximum value of 50 mg/lt. Nevertheless, the water board sees improvement as a result of the efforts over the years, including buffer strips (interview 5). Water quality in the CS area is poor as a result of intensive farming practices.

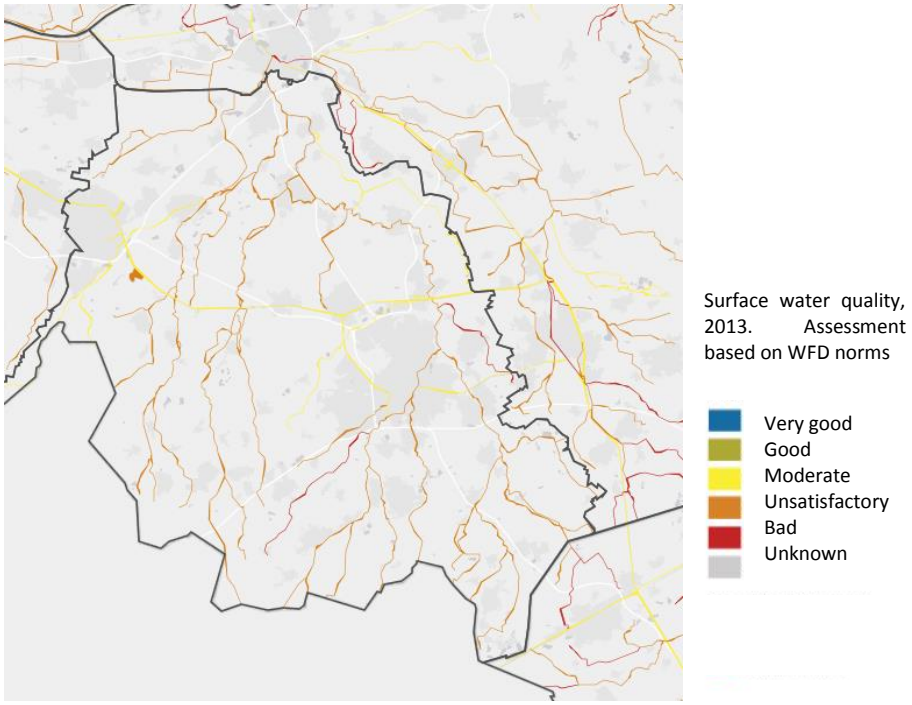

Figure 5: Water quality according to WFD criteria in De Dommel area. Source: IHW.

The water board and the MB Skylark group agree that information provision on water quality to the farmers has been poor (workshop 10 March 2017). The water board monitors the state of the larger water ways, while the farmers are interested in more specific information relating to their land and the effects of their farming practices. So far, the water board has provided information on levels of N and P in the larger water ways, but not on pesticide residues or on aquatic biodiversity.

Water quantity at times is a problem both in terms of too much and of too little water. In the sandy soils, water tables can be low in summer. At the same time, the area has only small differences in altitude, which makes it hard to drain excess water from the area in case of heavy rains. Soil health is vulnerable as a result of the sandy soils, decades of high application of animal manure and the use of heavy machines. Farmers are worried about soil fertility and structure. An analysis of provision and demand of ecosystem services (De Knegt et al 2014) shows that in this region soil fertility is too low for what is demanded for agricultural production. Also soil compaction, loss of soil organic matter and erosion by wind are threatening soil related ecosystem services.

Intensive arable production in the CS area is both a result and a driver of high land prices. These high land prices are a threshold for farmers to implement buffer strips. Another barrier

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is the practice to rotate land among farmers. The use of land for only one year makes investment in soil organic matter less attractive, and buffer strips less sustainable. Land is therefore key in designing incentives for sustainable development of farming in the area both in the sense of land tenure and stewardship.

Regarding soil-related ESBO's, there is market failure for the long term. Water-related ESBO's are hard to govern because of fragmentation of stakeholders both spatially and institutionally. In addition, it is difficult to trace back pollution to the source. This is especially the case for ground water. Also, unpredictable weather conditions require more resilience in landscape and farming practices to deal with both drought and excess water. The latter still has received insufficient attention.

How Skylark farmers analyse the levels of ESBO provision and determinants

The case study Skylark group is aware that management of the arable fields influences the water quality and also the water quantity in the sense of amount of runoff and peak levels in the rivers, as well as ground water levels in periods of drought (interviews 2,3,4, meeting). The water quality is affected by runoff and leakage of nutrients towards groundwater and surface water, as well as by residue of pesticides and fungicides that end up in ground water and surface water through runoff and air. Skylark links water quality to the need to irrigate: a good water quality is beneficial for the farmer (website).

The group links water quality and farm management to soil conditions (interview 2,3,4). According to interviewee 3, the sandy soil is suitable for a wide range of crops, but because the soil is so easy to work, farmers have become careless in its management. Group members are critical about farmers wasting their soil structure, which they notice as stagnant water on the land (report of Water Day). The group has an interest in raising soil organic matter: to improve soil structure and fertility, support soil biodiversity, reduce leakage of nutrients, improve water storage capacity and reduce sensitivity to crop diseases (interviews 2,3,4).

The Water board monitors water quality and water levels, but not many ditches on farms are monitored. Farmers wish for a more precise monitoring system to be able to locate problems and match solutions such as buffer strips to sites where they make sense (notes of meeting). Soil indicators are measured by a few individual farmers only. As one participant remarked: "*Farmers know a lot of what happens above ground, but nothing of what happens in the soil"* (interview 4). Skylark has organised courses to teach farmers how to dig a soil profile and how to assess soil structure. (See Annex 9.3 for share of Dutch Skylark participants taking specific measures.)

Appreciation of and demand for ESBO's soil and water

There is no well-functioning market for the ESBO's soil and water. Soil is partly reflected in land prices: in the case study area land is sold for €65,000–70,000/ha (http://landprijzen.nl/landbouwgrond/ and http://www.boerderij.nl/landbouwgrond/grondprijzen/?gebied=3008), and leased for prices between € 1,200-2,000 /ha/yr (interview 2). However, long term soil health is not reflected in lease prices. The market for water is fragmented into drinking water, water quality and water quantity. For water quality measures by farmers, the water board has budgetted € 1,05 M in the period 2014 -2020. In addition, € 2 M is to be invested in projects to rearrange the hydrologic system, and for WFD

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measures in rural area to be complemented with RDP funds (begroting De Dommel 2016). For drinking water, Brabant Water had a turnover of 170 M€ in 2014 (www.brabantwater.nl). However, the working area of Brabant Water is bigger than the case study area and it does not reflect the value of the part of the Meuse water originating from the case study area which is harvested for drinking water downstream by e.g. Evides (www.evides.nl). At national level, Ecorys (2012) estimated a national expenditure on water quality and availability of 25 billion Euros between 2009 and 2015, of which 20 billion public expenditure. This is however not a reliable indicator of value or demand.

2.4 Ancillary economic and social benefits provided 'on the back' of ESBOs

The farmers of the Midden Brabant Skylark group are familiar with laying out buffer strips for improving water quality. However, most of them prefer grass strips that are mowed regularly over multifunctional, biodiverse buffer strips that could also provide e.g. pollination and pest regulation. More biodiverse strips are not very hard to lay-out, but farmers fear weeds and pests coming in from the buffer strips. As a result, there is very limited biodiversity delivered as side-effect of the delivery of water quality. More biodiverse strips would also enhance landscape amenity.

A better water quality will benefit the biodiversity in water bodies. In addition, better water quality in the Dommel watershed would reduce the costs of purification for drinking water downstream (Meuse, see section 2.2.3). However, water quality in a much larger area would need to improve to achieve that.

Improving soil health is important to sustain the production capacity of the land for future generations: for food security as well as the economic sustainability of farming in the area. A good soil health implies well-functioning soil biodiversity, which in turn will benefit organisms that feed on soil life, including specific farmland birds.

3 Shifting societal norms, collective learning and voluntary actions

Skylark is a private initiative. The process for setting up the Skylark Foundation started in 2002 when the Heineken brewery approached a couple of its suppliers in Flevoland whether they could offer sustainable barley. These farmers viewed their farms as a whole and suggested that they would need to consider the production methods of other crops as well, because of the need for rotation (interview 1). They involved additional food industry companies: Suikerunie (sugar) and Van Liere (onions). With the aid of RDP subsidy, a project was organised and in 2009 a Foundation was set up. By now, a range of food processors, suppliers and advisors is involved in Skylark. Skylark is funded by the companies in the chain as well as by the participating farmers. At times, public funding is acquired for specific projects, but the meetings of the regional groups and the composition of the farm plans is purely privately funded.

The investment of farmers in time and money to be able to participate in Skylark is considerable: this demonstrates their motivation to participate in the network, to learn from peers and to improve their sustainability achievements (interviews 1 & 2). In addition to the intrinsic motivation of the farmers, the demand from the food processing companies for sustainable

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produce is a motivator. Some of those companies require their producers to have a Skylark certificate (see section 4.2.2). Lastly, the progressing environmental regulations are a driver for farmers to innovate towards more sustainable practices (interview 2). See section 4.2.2 for the Skylark sustainability indicators.

We presume that food chain companies have developed a larger interest in sustainable produce as a result of public discourse, market demand, and increasing awareness with their own personnel. While food chain companies participate at the national level by means of funding and taking part in the board of the Skylark Foundation (see also sections 4.1 and 4.4), they do not interact much with the regional groups. The regional groups choose their own topics on which they want to learn more as a group, and they may collaborate with local partners.

In Skylark, 'peer review' of sustainable arable farming practices during the group meetings and farm visits is seen as an important element for the awareness raising and intrinsic motivation of farmers (interview 1). All Skylark participants must compose a plan for each year, specifying their sustainability actions (see section 4.2). In the Skylark regional groups, farmers discuss each other's sustainability plans and at the end of the year the actions and results. Regional groups are led by an acknowledged regional coordinator and consist of 8-10 farmers who meet at least five times a year at each other's farms (interview 1). Often, they combine a discussion at the kitchen table with a field visit. In addition, interregional meetings are organised about specific themes (see also Nijman 2015). Each group has a budget for organising their meetings. The groups are stimulated to invite advisors from Skylark partners to contribute to these meetings (not the chain companies but the consultancies). Participants are obliged to attend at least eight meetings in total per year (interview 1, 2). '*Peer to peer exchange is crucial'* (interview 1). By meeting in small groups, farmers challenge each other in striving for sustainable practices. They meet regularly, visit each other's farm, learn from each other's experiences and set joint learning goals. Common themes for Skylark groups to work on are soil health and water quality. In the Midden Brabant group, this learning process triggered the wish to collaborate with the water board.

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Figure 6: Skylark Midden Brabant group discusses measures for water quality, 25 May 2016

For the Skylark group Midden Brabant, the Water board is their main partner in the improvement of water quality, and indirectly, soil health. In January 2016 the regional coordinator organised a meeting with Water board De Dommel, the neighbouring Skylark group Oost Brabant and Water board Aa en Maas to discuss possibilities for collaboration. In March 2017 this was followed-up in a meeting of the Midden-Brabant group and De Dommel water board (report of workshop 10 March 2017). The farmers consider land as an enabling factor in taking sustainability actions. For that reason they proposed the Water Board to work out a governance arrangement with land as incentive to improve water quality (see section 4.2.3). The farmers and the water board agreed to enter into a joint process of learning and exchange of data and information (see section 4.2.3). The farmers have expressed an interest in getting to know the water system better (report of workshop 10 March).

Skylark groups tend to go through development phases (interview 1). At first, they are busy discussing each other's sustainability plans. After a few years, they choose specific themes to learn on, such as soil health. The first groups in Flevoland have now started to consider their social environment and discuss themes such as licence to produce and short supply chains.

This case study suggests that knowledge and motivation of farmers are key factors for sustainable delivery of ESBOs. Specific practices, information and use of technology influence the level of delivery. The Skylark case shows, that participating farmers are motivated to learn from each other and copy good practices. In addition, as a group they are able to collaborate with authorities. Therefore the governance arrangement of regional farmers groups and sustainability plans is expected to be an effective strategy.

For the delivery of additional ESBOs, such as landscape amenity and biodiversity, the social learning strategy could benefit from involving citizens and environmental groups. So far, most

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Skylark Midden Brabant farmers have very limited interaction with citizens (see section 4.1). In addition, monitoring of ESBO's could provide feedback to their efforts (see section 4.2.2). The precision farmer is already putting this into practice to the extreme (see his website).

4 Mechanisms, (collective) actions and governance arrangements to enhance the level of ESBO provision

To safeguard water quality, water supply and soil health, collective action is needed. While water is a mobile resource, soil is not. However, because much land changes user all the time, soil can be considered a collective resource as much as water, in spite of often stable land ownership (see section 2.2.4).

4.1 Organisational capacities, leadership, networking and communication

The Netherlands have a tradition of farmers' cooperatives and study groups. Skylark fits into this tradition. The first group started in the reclaimed polders of Flevoland (see section 3), but groups have now been set up in all Dutch regions with arable farming. In total 388 arable farmers participate in Skylark in 40 groups; they manage in total 8,7% of the arable land in the Netherlands (interview 1, Skylark website, Skylark annual report 2015). Skylark at national level has a board with representatives of farmers, food chain companies and consultancies, a quality committee with farmers and food chain companies, and an advisory committee with representatives of research and educational institutes, civil society organisations and public administration (they are all listed on the Skylark website).

The national Skylark organisation has interactions with the NL Ministry of Economic Affairs, mainly about the greening of the CAP and the Skylark CAP certificate (see section 4.2.2). In addition, Skylark is involved in a policy platform about sustainable arable farming (*Akkerberaad*). In Europe, Skylark is connected to the European Initiative for Sustainable Agriculture. Skylark would want to discuss the possibility for Dutch authorities to become launching customers for sustainable food products, but so far this has not succeeded (interview 1).

So far, the Skylark group in Midden Brabant has very limited interaction with citizens and environmental groups. The precision farmer of interview 4 is an exception, and the farmer of interview 3 '*misses society and its appreciation'*. Most group members have a negative image of citizens, as having no knowledge of farming and being too critical, and they do not see delivering to local markets as a serious option (notes of meeting, interviews 3, 4). However, the group members are well involved in networks of farmers such as the farmers' union ZLTO. The relationship with the agri-environmental cooperative, organising the participation in the agri-environment scheme, is not very close (interview 2). The farmers feel that as a group, they have a stronger position in interactions with governments and other actors (interview 3,4, notes of meeting). They feel that they are being taken seriously, because they are large farmers (interview 2,3). The participants and the coordinator are positive about the social capital within the group: they are motivated to meet and they trust and learn from each other in spite of their being competitors for land (interviews 2,3,4).

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The Water Board acknowledges the value of the Skylark Midden Brabant group (Rob van Veen, pers. comm. 31 October 2016, interview 5). The Water Board is eager to develop collaboration with farmers because of the need to improve water quality, and expects that the Skylark farmers are seen as examples by other farmers in the area. The Water Board officials hope that if they manage to develop a good collaboration with the Skylark farmers, others will follow (RvV pers. comm.). Collaboration with private actors is part of the new mode of governance of the Water Board (interview 5). In addition to farmer organisations, the Water Board has relations with an extensive network of companies (including e.g. polluting industry), citizen initiatives, environmental groups, nature and landscape organisations and other water boards in the Netherlands and Belgium (interview 5).

For improved provision of ESBO's, expanding the network of the Skylark group with citizens and environmental groups could be beneficial. A limiting factor is the lack of economic prospect from local produce: local food cannot be an issue to connect farmers and citizens in a positive way. Also on-farm recreational activities are not seen as a serious business case for these large arable farmers. Licence to produce may be their main motivator for seeking interaction with citizens and environmental groups. The collaboration with the water board may pave the way for a more outward looking attitude with the Skylark farmers. The water board could help them get in touch with potential partners. In addition, they could follow the example of the precision farmer, who is already very outward looking and has good relations with citizens and environmental groups. One way to stimulate this could be to dedicate one of the regional meetings to 'how to develop relations with citizens'.

4.2 Innovative governance arrangements and mechanisms supporting ESBO provision

4.2.1 The Skylark approach of peer review en social learning

The Skylark approach of peer review en social learning has been described in chapter 3. We mention it here as innovative governance arrangement, because social learning may influence attitudes and eventually behaviour. It is innovative because it is a different strategy from the traditional instruments of regulations and subsidies. In addition, this social learning is not organised by a governmental agency, but by a private organisation of farmers and parties in the chain.

4.2.2 The Skylark sustainability indicators, farm plans, monitoring and certificates

The three basic principles of Skylark are: collaboration in the chain, sharing knowledge, and a system of continuous improvement (interview 1). The Skylark foundation carries out its objectives according to 10 sustainability indicators (including soil health & fertility, plant protection, water management, biodiversity, see text box below and Annex 9.1, where they are translated into ESBOs). These indicators were discussed in 2003 in the first Skylark group of around 10 farmers in Flevoland (this was a EU-funded RDP project). Skylark does not set performance levels for the sustainability criteria, rather the approach focuses on the process of improvement. This means that all farmers who wish to improve, can participate (interview 1). The participants can choose from around 200 sustainability actions, of which a number is listed in Annex 9.3.

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Box: Sustainability indicators used by Skylark (www.veldleeuwerik.nl):

1. Product value
   a. Economic sustainability
   b. Balance of revenues and costs
2. Soil fertility
   a. Soil structure
   b. Soil recovering capacity
3. Soil erosion
   a. Topsoil organic matter
   b. Cover
4. Nutrients
   a. Fertilisation
   b. Balance NPK
   c. Use of rest products
5. Crop protection
   a. Technique & methods
   b. Products (pesticides/ herbicides)
6. Water
   a. Water quality
   b. Water quantity for irrigation
7. Energy
   a. Machines/ fuel
   b. Storage/ climate
   c. Alternative sources
8. Biodiversity
   a. Above soil
   b. Soil biodiversity
9. Human capital
   a. Human capital
   b. Social capital
10. Local economy
    a. Relations with other farms
    b. Relations with other firms

Skylark participants are in general the larger arable farms. Technology is important to them and they learn the latest developments from each other. Of all sustainability criteria, above ground biodiversity is the least popular, by lack of incentives and because the cost-revenue balance is not attractive (interview 1). Soil health and soil biodiversity are much more interesting to the farmers, as well as water quality (interview 1,2,3,4). In the case study group, local economy is considered the most difficult criterion (interview 2, 3, notes of meeting).

Each year, a farmer develops a plan for his/ her own farm with the aid of an advisor. The farmer can choose which sustainability indicators to work on, but participants must have given attention to all 10 Skylark indicators within 4 years. Their efforts (not their results) are monitored in the Skylark database of 'sustainability profiles' which the participants fill out themselves. Attending regular group meetings is obligatory to stay a member of the foundation and to obtain a 'Skylark' certificate for sustainable farming.

According to the national coordinator, food processing companies increasingly require proof of sustainability performances (interview 1). The Skylark method of self-assessment with sustainability profiles has been acknowledged the silver level of SAI's FSA (Farm Sustainability Assessment: annual report)[4]. Skylark participants receive a certificate which gives them an advantage with some market parties. However, because each participant has his/her own approach, it is not easy to explain the meaning of the certificate (interview 2).

[44] SAI: Sustainable Agriculture Initiative, a global food & drink value chain initiative, see www.saiplatform.org

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In addition to the regular Skylark certificate for participants, the foundation managed to negotiate that arable farmers with an additional Skylark-CAP certificate are eligible for a number of alternative packages in the CAP greening (equivalent practice). Participants appreciate this: it confirms their view that Skylark helps to reduce bureaucracy (interviews 3,4). Skylark aims for a status of 'green by definition', just as organic farms (interview 1).

However, because performance is not monitored in terms of results, the effectiveness of the Skylark approach cannot be measured. A study carried out by students of Wageningen University pointed out that for many of the 200 measures it is very hard to find scientific evidence of their effects (Bisperink et al 2016). In addition, ways of working and physical conditions at farms can differ greatly. This makes predicting outcomes based on measures extremely hard. Much more monitoring would need to be done at farm level to get insight into impacts of the Skylark approach. However, even then linking measures to results would be very difficult, not in the least because of the complexity of the social-ecological system.

For water quality, the participants of the Midden Brabant Skylark group would welcome more and more fine-grained monitoring by the Water Board (notes of meeting).

The Skylark participants in Midden Brabant are well aware of the soil and water related ESBO's. However, thinking in terms of sustainability is more familiar to them than ESBO's. The introduction of vocabulary of services and beneficial outcomes was welcomed in the regional meeting attended by a researcher (notes of meeting). Their learning process could be further supported with knowledge and practical examples with respect to the ESBO's as well as favourable farming practices. In addition, a monitoring scheme for those ESBO's could support their efforts and provide feedback (see also the section on learning 3).

4.2.3 An arrangement for exchanging water quality measures for land lease

The Skylark group tries to set up a collaboration with the Water board to develop buffer strips along shores as well as reed fields in lower areas to improve water quality, in return for land elsewhere. For this, they want to develop a new governance arrangement for buffer strips. The envisioned buffer strips are much broader than the mandatory 0.25-150 cm.

In addition, or as alternative, they propose the layout of a reed field to filter the water that originates from a group of farms (notes of meeting, interview 4). They proposed to the Water board that instead of subsidy, they would like to be able to lease land from the Water board to compensate for the production space (interview 2,3, report of Water Day). The Water board owns 180 ha in the region (interview 3). They request a preferred position when the Water Board gives out land to farmers. The idea could be extended with land that is owned by the province, municipalities, nature organisations and rural estates.

Such a governance arrangement needs to be negotiated between the Skylark Midden Brabant Group and Water Board De Dommel:

1. What measures do the farmers offer?
    a. Size, layout, management and duration of buffer strips and helophytes.
    b. Suitable sites and spatial coherence

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   c. Other measures
   d. Added value of Skylark membership for Water Board
2. What do the farmers request in return?
   a. Available subsidies?
   b. What land is suitable (size, distance, zoning status, ...)
   c. Type and duration of contract for land tenure, price for lease of land
3. How to select farmers?
   a. Criteria, order of importance
   b. Who selects?
4. How can the Water Board justify this kind of 'support'?
   a. Examples from elsewhere
   b. Pilot
5. What agreement is needed about reporting, monitoring and evaluation?
   a. More fine-grained water quality monitoring, for a better insight in the relation between effort and result
   b. What kind of report does the Water Board expect from the farmers about the implemented measures?
6. How and when will Water Board and Skylark evaluate, with what outcome are they satisfied?

Using land as an incentive to promote provision of ESBO's is innovative. As a rule, financial incentives are provided. However, by the Skylark participants in Midden-Brabant, land is considered as more convincing than money. Some of them participate in the agri-environment scheme in which buffer strips are also a management option, but they do not find the scheme very attractive because of the high number of rules and the low popularity of the agri-environmental cooperative (interviews 2, 3). Some farmers will prefer a payment, others will prefer land in exchange (interview 2). In the Netherlands, there are a few examples of schemes in which land is used as incentive to promote provision of ESBO's (Westerink et al., 2010). Nevertheless, although this arrangement is still in an experimental stage, similar solutions could be relevant in other regions with high land prices.

However, the Water board is reluctant to give a preferred position to some farmers above others (interview 5). For that reason they do not wish to further develop the idea. Even a workshop with water board officials and the Skylark MB group of farmers did not change their opinion (report of workshop 10 March 2017, see also Annex 10). Nevertheless, the water board is planning to change its land policy and to select land managers based on sustainable land management. What this encompasses, still needs to be developed. Skylark farmers can apply for this land, but they will not be favoured over other farmers who can show the desired sustainability requirements.

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Table 3: Assessment of Skylark governance arrangements

Arrangements Assessment	Skylark social learning	Skylark sustainability plans and certificates	Skylark land for water quality
Advantages	Appeals to intrinsic motivation, development of skills, peer-to-peer	Accessible to all willing farmers, individual approach, pressure from food processors, private initiative	Proposal by farmers: motivation to participate
Transferability	Well transferable: in case of low social capital reviewing each other's sustainability plans may be less feasible. On the other hand: social learning can build social capital	Requires high levels of organisation	Experimental idea, but maybe relevant to other regions
Difficult issues	Limited view due to absence of citizens	Meaning of certificate is not clear because of individual approach. No monitoring of results/ ESBO's	Needs to be developed
Support	Supported by parties in the chain	Supported by parties in the chain	No support from Water board: wants to avoid privileges

Instead, in the workshop of 10 March 2017 alternative pathways were identified on which the Skylark farmers and the Water board wish to collaborate:

- Exchange data and knowledge about farming and water system between farmers and water board: start a process of mutual learning and joint field visits.
- Try out and monitor 'smart' buffer strips and reed filters on land of one of the Skylark participants
- Work towards a more robust water system (i.r.t. flooding and drought) and tailored water management, including areas that are allowed to flood against compensation.

4.3 The role and impact of policy in ESBO provision

4.3.1 Influence of policy instruments on ESBO provision

See section 2.2.4 for an overview of main environmental policy instruments at the various levels of government.

There is very little policy aimed specifically at enhancing soil health (Van Doorn et al., 2017). However, the Nitrates Directive and subsequent national and regional policies obviously impact on soil health. On the one hand, the limits on fertilisation set per type of crop and soil type limit the amount of fertilizer that can be applied. This prevents over-fertilisation. However, the limits for animal manure and compost are stricter than those for chemical fertilizer. As a result, the Skylark farmers in the CS area feel constrained by the legislation in their efforts

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to raise soil organic matter (interview 2, 3, 4, see also section 2.2.4), while soil organic matter is essential for soil health. In addition, they are not satisfied with control and sanctioning that gives penalties without giving a chance make amends and correct the problem. They understand that strict rules are needed for the 'bad guys', but they feel that they deserve more room for manoeuvre if they can prove that they strive for more sustainability (interview 3,4).

The lack of policy instruments for soil health may become problematic considering the practice of 'land rotation'. Raising soil organic matter is a long-term activity. Land owners cannot include prerequisites in land lease contracts (*Pachtwet*) – tenants must comply with GAP anyway - , so they cannot demand that the tenant applies compost. Land owners can only steer through selection of tenants that they trust to take care of the soil, and they can make informal agreements. When tenants lease the land for only one season, which is increasingly the case due to specialisation in crops, there is little incentive for the tenant to invest in soil health on that land. At the same time, tenants do not know the quality of the land they hire. Since both tenants and land owners have limited tools to steer towards improving soil health on the longer term, while all would benefit from that, land has become a common pool resource. If farmers do not manage to self-organise and self-govern the stewardship of the soil (Ostrom, 1990), policies are needed.

So far, considering the insufficient water quality to WFD standards in the case study area (see Figure 5), policies aimed at improving water quality seem to have been largely ineffective. As the agriculture in the region is one of the most intensive in Europe, the sector puts a large environmental pressure on natural resources. Driven by market forces (among other things), farmers tend to intensify and specialize their production, resulting in very high concentrations of livestock in the area and in intensive practices in arable farming. Clearly, both environmental regulation and agri-environmental schemes are not sufficient to improve the situation. For the bigger arable farms, agri-environmental payments do not contribute substantially to the farm turnover. The intensive livestock farmers do not have enough land to feed their animals, so they use it in an intensive way and agri-environmental management to them is not attractive. Not only agriculture is a major pollutant, also a number of large industries and urban areas contribute by releasing polluted water to the surface water. However, according to a water board official, levels of nutrients in the water are improving as a result of the regulations (interview 5). Although hard to measure, she also sees the benefit of buffer strips. Effectiveness of buffer strips may vary greatly as a result of weather circumstances and location (interview 5). The water board therefore agrees with the Skylark farmers that buffer strips need to be carefully planned.

The water board has put several policy instruments in place to safeguard water quality and water availability:

- Regulations about water levels and management of waterways (Keur)
- Regulations about emissions via air and water (Algemene regels)
- Subsidies for water storage on farmland and buffer strips along waterways (StiKa, in collaboration with agri-environmental collective, see section 4.3.2)
- Permits for irrigation, on condition of farm plans to save water and reduce drainage (beregeningsbeleid, bedrijfswaterplannen)

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- Agreements with other public and private actors, such as Deltaplan hoge zandgronden: plan to keep water in the area as long as possible in collaboration with province of Brabant, other water boards and farmers' union ZLTO
- Projects, such as Schoon water voor Brabant, to reduce pesticide emissions to the surface water
- Monitoring of water availability and water quality through a mesh of monitoring points (meetnet)

The water board is also interested in soil because of the interaction with water, but does not have policies itself and depends for this on other tiers of government, especially the province and the EU. Through the rural development programme, the water board tries to promote knowledge transfer about the relation between water and soil. See also section 2.2.5.

In the region most farmers receive direct payments from the CAP, all arable farmers in the region have to comply with the EFA measure (Ecological Focus Areas, part of the greening requirements). The far majority of the farmers has sown catch crops as EFA, resulting in more than 4,000 ha of EFA in the region. However, significant environmental effects are not expected as the catch crops will not develop sufficiently. In case EFA's would have taken the form of bufferstrips or managed field margins the environmental impact would have been greater, but the incentive to implement these types of EFA's was too low.

4.3.2 Interaction of policies with private schemes: agri-environmental cooperatives

In the Netherlands, as early as the nineteen nineties, farmers started to self-organise to manage environmental issues and to collaborate in landscape management (Polman, 2002). Since then, a range of scientific articles has been published on the Dutch agri-environmental cooperatives (e.g. Glasbergen, 2000; Franks & McGloin, 2007; Westerink et al., 2015). In various ways, agri-environmental cooperatives have been instrumental in the implementation of agri-environmental policies. They have always had a role in motivating farmers to participate in agri-environment schemes. Increasingly, they have become active in the spatial planning of agri-environmental measures and in monitoring of results (Westerink et al., 2015). As of 2016, the revised agri-environmental scheme is mostly implemented by the agri-environmental cooperatives, which now cover the whole territory of the Netherlands. Many of the smaller cooperatives had to merge or to form an umbrella organisation in order to be able to comply with the criterion of 'professionality'. These larger 'collectives' compose a management plan for their area to apply for agri-environmental subsidies with the province. In turn, the collective recruits farmers in its area to participate in the management and takes care of the contracting, control and payment (Westerink et al. in review). Individual farmers can no longer apply for agri-environmental subsidies with the province: they need to negotiate with the collective.

Traditionally, the larger part of the agri-environmental budget in the Netherlands was spent on conservation of meadow birds. Suitable areas for meadow birds are mainly the lowland grassland areas. This is also where the more active agri-environmental cooperatives were situated. By now, there are also some strong collectives in arable landscapes (especially Groningen and Flevoland).

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Our case study area does not have a tradition of high participation in AES and of active agri-environmental cooperatives. In the current scheme, a limited budget was allocated to this region. ANV Kempenland is the agri-environmental cooperative here: it has joined the Midden-Brabant collective. That participation in the agri-environment schemes and membership of agri-environmental cooperatives do not have a strong tradition in this area may be due to a number of factors. First, unlike the meadow areas there is not one dominant farm sector. The diversity in farmers may have diminished a shared sense of urgency. Second, because of the small-scale landscape, there are few meadow birds and therefore little budget available. Third, this is an area of intensive arable farming and intensive livestock farming. With only few natural limitations to production, farmers do not feel the need to integrate nature into their farm. Therefore, although there is an agri-environmental cooperative and there are management options open to them in the agri-environment scheme (such as buffer strips), not all farmers in the area identify themselves with the agri-environmental cooperative (interview 2).

Interestingly, around 2006 (when the AES was still a national affair), the province of Brabant was very active in developing an alternative agri-environmental scheme together with the water boards. This StiKa (StimuleringsKader) is still operational.

4.3.3 Coherence of policy mix

As no EU policy framework for soil exists and also no policy on national level has been put in place, there is a lack of policy for soil health. Although the Nitrates directive and the subsequent Netherlands Manure act are intervening on soil related issues it is not sufficient to safeguard soil health.
For water quality and water availability there is a more coherent policy mix. Not only are policy instruments at place at EU, national, provincial and water board level, and are instruments for water and biodiversity interlinked, public policies are combined with private action, in projects and agreements and through the agri-environmental cooperatives. Also in our case study of the private Skylark Midden Brabant group, collaboration with the water board is developing. Nevertheless, water quality is still insufficient, mainly as a result of market pressure and the lack of effective environmental regulation and agri-environmental policies. The AES in the Netherlands are mainly focused on biodiversity goals and therefore only to a limited extent effective for water objectives.

4.4 The role of the private sector in ESBO provision and enabling factors

See sections 3 and 4.

Figure 7 and Table 4 give an overview of foods chain companies that are partners in the Skylark Foundation[5]. Many of them mention their participation in Skylark on their website.

See the Skylark website for an overview of consultancies and knowledge organisations[6] that are partner in Skylark. The knowledge organisations include producers of pesticides and chemical fertilizers, laboratories, R&D companies, a bank and the farmers union. These knowledge

[5] This is dynamic. The website of Skylark has an up to date overview.
[6] http://veldleeuwerik.nl/de-partners/de-adviesorganisaties/

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partners cannot take part in the board. According to Martijn Buijsse (pers. comm. 23/2/2017), the knowledge partners support the strive of Skylark for integrated farming. They have an interest in a good image of conventional farming and a skilful application of their products, reducing negative impacts on the environment.

Because such a large number of farmers and a wide range of chain companies participate, the Skylark initiative is robust. By enabling all willing arable farmers to move towards more sustainability, the initiative has the potential for a great reach and a big change. However, the sustainability ambitions are not clear in the sense of verifiable targets for the sustainability criteria. Also, the stake that suppliers of chemicals have in Skylark may slow down a real transition of the sector.

Figure 7: Food chain companies participating in Skylark Foundation (2016)

Skylark aims to gain room for manoeuvre for its farmers: room for alternative pathways to sustainability than the in their view often hindering regulations. However, in our view, Skylark's strive to get all arable farmers to move towards sustainability can be supported by more ambitious and at the same time less detailed regulations. In other words: more ambition AND more room for manoeuvre.

http://veldleeuwerik.nl/de-partners/de-kennispartners/

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Table 4: Food chain companies participating in Skylark Foundation (2017)

Name	Crops/ products	Role in the chain	International?
Suikerunie	Sugar	Processing & trade. Producers' cooperative.	International market
Koopmans meel	Flour (grain)	Processing	NL
Limagrain	Seeds (grain)	Supplier	Part of Limagrain Europe
Nedato	Potatoes	Producers' cooperative	International market
Gebr. Van Liere	Onions	Production, processing & distribution	Market mainly Dutch supermarkets
JWK	Onions	Processing & distribution	International market
Holland Malt	Barley --> malt	Processing	International market
Heineken	Barley --> beer	Processing & distribution	International market
Hazera	Vegetable seeds	Supplier	International
HAK	Root crops, arable crops	Processing & distribution	International market consumer products
For Farmers Hendrix	Feed	Processing & distribution	Delivers to livestock farmers, international market
CZAV	Various (arable, horticulture, feed for livestock)	Cooperative: delivers seeds to growers and feed to livestock farmers. Collective purchase of arable produce.	NL
Coca Cola	Sugar	Processing & distribution	Multinational
Bejo	Vegetable seeds	Supplier	NL
HZPC	Potatoes	Processing & distribution	Multinational
Agrifirm Plant	Various (arable, horticulture, arboriculture)	Producers cooperative	NL
Aviko	Potatoes	Processing & distribution	International market (retail)
Agrico	Potatoes	Cooperative: delivers seed potatoes to growers and sells produce to retail	International market

5 Potential pathways towards an enhanced provision of ESBOs

To improve water quality in the case study area, lower levels of fertilization are needed (especially the use of fertilizers that easily wash out (slurry manure, chemical fertilizer)) as well as lower emissions of pesticides. In part, there are technical solutions for this such as precision farming. Networks of farmers and chain parties such as Skylark can aid innovation and the spread of more sustainable practices. Broad buffer strips can further reduce emissions to reach the surface water. Preferably, these buffer strips are multifunctional to also benefit biodiversity, pollination, natural pest reduction and landscape amenity. Also, a spatial design would be needed to locate buffer strips at suitable locations and to create the coverage needed to really have an impact. This implies that a number of farmers needs to be involved: either their efforts need coordination by a third party (such as the water board) or they would

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need to self-organise (Westerink et al in review). Groups such as Skylark and the agri-environmental cooperative could be a vehicle for that.

However, it is questionable whether a good water quality can be achieved without reducing intensity of production with lower inputs and probably lower production levels. This directly impacts on the farm businesses and their income and will not be supported by the farmers. More ambitious environmental regulations can help create a level playing field for reducing intensity of production, but they will meet with resistance. Governments would need to negotiate and collaborate with sustainability-oriented farmers' networks to design accompanying measures such as extension and programmes for innovation.

To improve the availability of water and reduce problems with peak water, the water board could collaborate more closely with farmers and other land holders to work out plans to optimise shortages and oversupply of water throughout the year and within the area. The current system is based on quick removal of water from agricultural land: this is not sustainable towards the future. Capacity for water storage is needed, not only to be able to solve storm water peaks (such as in June 2016), but also to deal with dry periods in the growing season (which may occur more often as a result of climate change. A combination may be sought with goals for biodiversity and recreation in a landscape design.

To improve soil health, organic inputs should replace chemical inputs (including fungicides) as much as possible. Compost, mulch and stable manure should get a privileged position over chemical fertilizer and slurry manure. Not only would this need a change in farming practices and farmer attitudes, it would also need a change in regulations. For instance, it would be good to diminish the exceptional position of chemical fertilizers in the manure legislation where the limit on the use of animal manure is more strict than the limit on the use of chemical fertilizer. Also, the rules currently prohibit application of crop residues from other farms because of hygiene: this could be made easier. Much can be learnt from organic agriculture. Skylark spreads knowledge of soil management from the organic sector to its conventional farmers.

In addition, to deal with the problem of diminishing soil health due to 'land rotation', collective action of farmers is needed. They would need to develop a self-governance arrangement for yearly the exchange of land use rights within a network of farmers who wish to invest in the land and be sure that others do the same (Ostrom 1990).

6 Suitability of the SES framework and 'action-orientated approach' in the analysis of ESBO provision

The SES framework was helpful in considering various relations and levels of scale within the system. Because ESBO provision is central, both social and ecological aspects inevitably need consideration. In other words: ESBOs and SES are part of the same paradigm. It enforces an interdisciplinary approach of ecologists and social scientists. This is an advantage in gaining understanding of complex issues. However, the SES is so multi-faceted, that research of the many relations mainly relies on mere qualitative descriptions.

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We used the SES framework to look for data and documents and filled gaps through interviews. The interview questions were based on the SES framework, but tailored to the interviewee.

When explaining the SES framework and ESBOs to the farmers of the Skylark MB group, the farmers understood the essence. Especially the idea of ecosystem services and public goods appealed to them, they recognized the demand from society for a wide range of ESBOs. They felt frustrated that in their perception society increasingly demands more from farmers, without payment (notes of meeting). Although the basic idea of interdependencies between the social and the ecological appeals to many stakeholders (this is our experience also in other projects, see for instance Westerink et al 2017), in our view the wording (SES, ESBOs) is not attractive in interaction with stakeholders. In scientific discourse, we propose to stick with social-ecological systems, public goods and ecosystem services, because these terms are broadly accepted and used in literature. In interaction with stakeholders, we have good experiences with 'landscape' and 'landscape services' (Westerink et al 2017).

Common pool resources of course are at the core of Ostrom's conception of the SES (Ostrom 2009). From that point of view, in Pegasus we consider ecosystem services, public goods and common pool resources (or collective goods, or quasi-public goods). Some ecosystem services are public goods (such as landscape amenity), some are private goods (such as potatoes), some are club goods (such as access to private parks) and some are common pool resources (such as fish in the sea) (see also Costanza et al 2014). Not all public goods etc. are ecosystem services, however. And then there is also natural capital as related concept. See for an attempt to get some order in the concepts Jones et al 2017.

The framework could be improved by giving the ESBOs a place: in our view, ESBOs can be represented as an arrow from resource units to actors. There also needs to be an arrow from the action situation to the ESBOs, because many ESBOs require labour before they can be enjoyed (Jones et al., 2016).

For not place-based initiatives, the ecological part of the SES would need to be redefined to be able to consider how the social system is influenced by the ecological system and vice versa. For issues of dynamic change, some arrows will need multiple descriptions. A narrative is a good way to capture both complexity and dynamics.

In decision-making, the SES framework can help policy makers to see the bigger picture. Of course they often do consider the bigger picture, using their skills in their policy practice, but the SES framework can support doing that in a structured way.

For identification, quantification and valorisation of ESBOs, this version of the SES framework does not seem to have much added value.

The action-oriented approach gives the opportunity to observe the actors in the action, with gives additional insight into motivations and power relations to interviews and documents only. Also, it helps to investigate the practical value of scientific concepts. A danger of an action-oriented approach is the loyalty evolving from the social capital developed between the

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actors and the researchers. This may hinder objective observation and reporting. Combining involvement with distance is a major challenge of the researcher in an action-oriented approach. Another challenge is to balance confidentiality with research. More observations are made and information gathered than can be reported ethically.

In the Dutch context, interaction between researchers and farmers, collaboration between farmers and authorities, and networking are standard practice. An action-oriented approach may be easier to accomplish in the Netherlands than in many other parts of Europe.

7 Main conclusions derived from the Steps 3-4 analysis

7.1 Key findings on the particular SES and the provision of ESBOs

In the area of De Dommel, where most farmers of the Skylark Midden Brabant group have their arable farm, water quality is below the norms of the Water Framework Directive. For a large part, this is due to intensive farming practices. Environmental policies so far have not yet resulted in a satisfactory water quality. The Skylark Midden Brabant group has chosen water quality as one of the issues they want to work on. One of the strong features of the Skylark approach is that farmers are motivated to move towards sustainability by their peers and their supply chain partners. In their yearly sustainability plan, they specify the actions that they choose to take on their farm.

In addition to water quality the farmers have chosen to work on water quantity - both availability in times of drought and management of excess water - and soil health. As individual land managers, management of soil structure and soil organic matter are feasible actions on land that they use for multiple years: for the management of water quantity at landscape level they need the water board. However, an increasing share of the land that is hired is hired for only one season, as a result of progressing specialisation in especially potato growing, combined with the need for crop rotation. This practice of 'land rotation' discourages farmers to invest in the land they use short term, especially in soil organic matter, which makes them worry about the behavior of the other farmers that have used that piece of land, and about its quality.

Farmers represent the demand side for soil health, but so far they have not managed to self-govern its provision. The demand for water quantity is both with farmers and with downstream areas, which may translate to safety in lowland areas (including cities). For that reason there is public policy on water quantity. The demand side for water quality is represented by the drinking water companies in the region as well as downstream and the water board. While there is very little public policy aimed at soil health, water quality is heavily regulated at the EU, national, provincial and water board level.

7.2 Key findings on governance arrangements and institutional frameworks

While the environmental regulations have not yet succeeded in achieving a satisfactory water quality in the case study area, they did result in raising awareness with the farmers of the Skylark Midden Brabant group. This is supported by the demand for more sustainable produce

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by the Skylark supply chain partners. Therefore, European, national and regional legislation are useful to support private initiatives such as Skylark and collaboration between private and public parties, such as between De Dommel water board and the Skylark Midden Brabant group of farmers.

The Water Framework Directive has been translated to regional circumstances by the State and the Water board (for water quantity there is more room for regional tailoring than for water quality, interview 5). Nitrates Directive has been translated to regional and crop-specific circumstances by the state. However, the interaction between the various policies and legislations at farm level needs to be considered better. An example is the combination of the Nitrates directive and land use rights, constraining the raising of soil organic matter, impacting on soil health, water quality and water availability.

The Skylark approach of social learning, involvement of the supply chain, and challenging farmers to improve in terms of sustainability represents a set of governance arrangements that have the potential to contribute to a better provision of a wider range of ESBO's than only food. It has that potential because the approach is aimed at behavioural change, and is accessible to all willing farmers, regardless of their performance level. At the same time, this is the weakness of the approach, since the focus on efforts makes it very difficult to show the difference made at farm and national level in terms of impacts.

7.3 Other enabling or limiting factors

Macro-issues such as extreme weather events can dominate the discussion and the focus of farmers. In our case study, the attempts to work on water quality in collaboration between the group of farmers and the water board was overshadowed by the effects and aftermath of the extreme rainfall in June 2016. The risk of drought in summer are then easily forgotten by the farmers, when pleas are made to remove water faster from the area (workshop 10 March 2017). Such short-term reactions can diminish the focus on long-term sustainability and resilience.

7.4 Contributions to EU strategic objectives

The Skylark approach contributes to EU strategic objectives of sustainable growth because of its focus on enhancing sustainability performance of conventional arable farmers, with a broad range of sustainability indicators. Through the involvement of the supply chain, the approach is embedded in the market. However, many Skylark participants choose the less ambitious options, resulting in less than optimal provision of ESBOs. In part, this is due to the low market value of Skylark membership: not all Skylark supply chain partners require Skylark membership of their suppliers or pay a premium price to Skylark participants.

In addition, the Skylark approach contributes to smart growth because of its focus on social learning, enabling farmers to get acquainted with new technology, try out new things, and discuss innovations in farmer groups.

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7.5 How about the transferability of the approach/mechanism used?

The Skylark approach is based on collaborative learning among farmers, involvement of the supply chain, and challenging farmers to improve through the yearly sustainability plans (Interview 1, Martijn Buijsse pers. comm. 15-3—2017). In England and in Poland, initiatives have started to develop a similar approach. While the principles of collaborative learning, involvement of the supply chain, and challenging farmers to improve are transferred, in both countries the initiatives are tailored to the local needs and culture (Martijn Buijsse pers. comm. 15-3-2017). Farmers and supply chain parties are brought together to design their own set-up with respect to sustainability indicators, meetings and organisation. In Poland, there is more focus on capacity building of the farmers, while in England the initiators focus on precision agriculture, water quality and soil health (Martijn Buijsse, 15-3-2017).

We believe that the learning approach is transferable to many other regions in Europe, even – or maybe especially - to regions where collaboration among farmers is less frequent than in the Netherlands. Social learning may be a step before collaboration because it is less threatening than full collaboration, while it still builds social and human capital.

In addition, a strong feature is the focus of the Skylark approach on conventional farmers. In order to enhance the provision of ESBO's, a growth of the number of organic farmers is not sufficient; also conventional an intensive farmers will have to change their practices. For such behavioural change, innovative public and private governance arrangements are needed. In our view, the Skylark approach can be an inspiration for such governance arrangements aimed at conventional farmers throughout Europe.

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Interview 3: Martijn Thole, farmer, Skylark participant, water board administrator (19 May 2016)

Interview 4: Jacob van den Borne, arable farmer, Skylark participant (25 May 2016)

Interview 5: Marinka de Wit, water board official (19 May 2016)

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9 ANNEX

9.1 Translation of Skylark indicators to PEGASUS ESBO's

Skylark indicators		PEGASUS Framework, selected for case: soil and water
Indicator	**Sub-indicators**	**ESBO**
1. Product value	Economic sustainability	
	Balance revenues and costs	1. Sustainable and sufficient production of food
2. Soil fertility	Soil structure	10. Soil protection: Achieving (or maintaining) minimisation of soil degradation
	Soil recovering capacity	Healthy functioning Soils (9 + 10)
3. Erosion	Topsoil organic matter	10. Soil protection: Achieving (or maintaining) minimisation of soil degradation
	Cover	10. Soil protection: Achieving (or maintaining) minimisation of soil degradation
4. Nutrients	Fertilisation	9. Soil functionality: Achieving (or maintaining) good biological and geochemical condition of soils
	Balance NPK	9. Soil functionality: Achieving (or maintaining) good biological and geochemical condition of soils
	Use of rest products	9. Soil functionality: Achieving (or maintaining) good biological and geochemical condition of soils
5. Crop protection	Technique & methods	13. Biological pest and disease control through biodiversity: achieving (or maintaining) high levels of biological pest and disease prevention and minimisation of the impacts of potential outbreaks using biodiversity
	Products (pesticides/ herbicides)	11. Species and habitats: Achieving (or maintaining) the presence of diverse and sufficiently plentiful species and habitats (ecol diversity)
		12. Pollination: Achieving (or maintaining) high levels of pollination
6. Water	Water quality	2. Water quality: Achieving (or maintaining) good ecological status of surface water and good chemical status of groundwater
	Water quantity for irrigation	3. Water availability: Achieving (or maintaining) a regular supply of water (i.e. avoidance of water scarcity)
7. Energy	Machines/ fuel	5. GHG emissions: Achieving (or maintaining) minimisation of greenhouse gas emissions
	Storage/ climate	5. GHG emissions: Achieving (or maintaining) minimisation of greenhouse gas emissions
	Alternative sources	5. GHG emissions: Achieving (or maintaining) minimisation of greenhouse gas emissions
8. Biodiversity	Above soil	11. Species and habitats: Achieving (or maintaining) the presence of … species and habitats (ecol diversity)
	Soil biodiversity	9. Soil functionality: Achieving (or maintaining) good biological and geochemical condition of soils
9. Human capital	Human capital	17. Health & social inclusion: Achieving (or maintaining) an appropriate level of therapeutic /social rehabilitation activities in relation to farming and forestry
	Social capital	14. Landscape character and cultural heritage: maintaining or restoring a high level of landscape character and cultural heritage
10. Local economy	Relations with other farms	1. Sustainable and sufficient production of food
	Relations with other firms	1. Sustainable and sufficient production of food
		14. Landscape character and cultural heritage: maintaining or restoring a high level of landscape character and cultural heritage

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9.2 Supporting data and statistics (source: CBS)

Area (ha)	Nederland 2004	Nederland 2014	Noord-Brabant 2004	%	Noord-Brabant 2014	%
Agriculture, total	194,940,340	183,901,711	26,168,250		24,467,021	
Arable	61,353,235	51,727,912	8,510,813	32.5%	6,343,187	25.9%
Uncultivated, total	13,028,562	16,188,484	1,631,186		1,750,780	
Potatoes, total	16,386,447	15,625,247	1,723,843	20.3%	1,872,690	29.5%
Root crops, total	5,136,480	5,499,019	1,067,423	12.5%	1,016,744	16.0%
Cereals, total	22,626,080	19,312,819	3,236,255	38.0%	1,970,637	31.1%
Grass seeds	2,532,533	1,201,363	455,066	5.3%	189,763	3.0%
Trade crops, total	1,175,385	1,158,140	207,452	2.4%	171,682	2.7%
Legumes, total	547,461	285,347	57,513	0.7%	17,029	0.3%
Sugar beets	9,773,335	7,509,401	1,200,222	14.1%	872,553	13.8%
Other arable crops	645,358	364,727	167,469	2.0%	78,705	1.2%
Fallow	2,530,156	771,849	395,570	4.6%	153,384	2.4%

Number of farms	Nederland 2004	Nederland 2014	Noord-Brabant 2004	%	Noord-Brabant 2014	%	Reduction 2004-2014
Total	83,794	65,507	14,792		11,550		-21.9%
Cultivated land, total	82,575	63,830	14,455		11,070		
Arable farms, total	28,320	19,183	6,655	45.0%	4,206	36.4%	-36.8%

Share of land surface 2012	
Agriculture in the Netherlands	54%
Agriculture in Middle-East Brabant	60%
Water in the Netherlands	9%
Water in Middle-East Brabant	2%

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9.3 Statistics from the Skylark Annual Report 2015

Participating arable farmers:	388
Acreage of Skylark participants:	>45.000 ha = 8,7% of arable land in the Netherlands
Number of partners:	63
Skylark consultants:	42
Supra-regional knowledge meetings:	38 (>600 participants)
Meetings of regional groups:	300 (6 per week)
Regional groups:	40
Sustainability measures in indiv. plans:	2,837
Crops:	80 (74% grains, potatoes, sugar beets)
Potatoes for consumption:	372,000 tons (24% of Dutch demand)
Sugar beets:	500,000 tons (94% of Dutch demand)
Grains:	130,000 tons (9% of Dutch demand)
Onions:	180,000 tons (176% of Dutch demand)

Of all participants, the following share takes the following sustainability actions:

Sowing catch crops after main crop:	92%
Own marketing concept:	8%
Decision support system pest reduction:	54%
Use of compost:	52%
Production of solar energy:	44%
Using farmyard manure:	60%
Precision fertilizing:	27%
Visits from schools:	26%
Active in boards:	52% within agriculture, 41% outside agriculture
Multi-annual buffer strips/ field margins:	24%
Irrigation depending on sensor:	34%
Poles for birds of prey:	59%
Voluntary sampling eelworm in soil:	64%
Regular soil profiling:	67%
Making balance soil organic matter:	73%

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10 ANNEX: Reflections on the case study methodology used

This section focusses on the action mandate and its implementation by the research teams. It provides an overview of the participatory process, and its outcomes. It has to be discussed with the actors whether and in which format this section can become published. It has to be available internally for the comparative analysis but could be removed before publication.

10.1 Objectives and activities undertaken with initiative/stakeholders

The action-oriented research was carried out in collaboration with the Skylark Midden Brabant regional group of arable farmers and De Dommel water board.

In steps 1+2, the research team spoke to the national coordinator of Skylark, who agreed to recruit a regional group that was interested to work with us. The Midden Brabant group responded, after which the research team spoke to the regional coordinator of this group. In addition to studying documents and the website and conducting a number of interviews, one of the researchers participated in one of the regular meetings of the Midden Brabant group. The draft report of steps 1+2 was shared with the national and regional coordinators.

Based on the research in the first phase (steps 1+2) the research team formulated three options for further collaboration in the case study in steps 3+4:

1. Support the development of a governance arrangement for laying out buffer strips and/ or helophytes in exchange for the right to lease land from the Water board. Such an arrangement could include more spatial design and more intensive monitoring. To be developed in collaboration with the Water board.
2. Making buffer strips more multifunctional: not only water quality, but also biodiversity, natural pest reduction and pollination.
3. Developing collective action for raising soil organic matter. Much land exchanges land user each year. Soil health and soil quality have become a common pool resource: can soil management be developed in a collaborative way and how? Fuelling discussions in the Midden Brabant Group.

In consultation with the regional coordinator we selected the first option. This is an idea that was developed in the group itself, and explorative discussions with the water board have already taken place. The group was not enthusiastic about the second option, because most farmers did not believe in the added value of natural pest reduction. The third option is urgent and innovative, but would require a longer and more extensive process than can be realised within Pegasus.

In a meeting with the water board, the research team and the Skylark regional coordinator proposed to explore the possibility for developing such an innovative governance arrangement for the improvement of water quality. The water board agreed to a joint workshop with the farmers of the Midden Brabant Group and water board officials. A researcher and the Skylark regional coordinator jointly designed a programme for this workshop. The Water Board was requested to present a map with the water quality situation of the area.

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10.2 Outcomes and further steps

The workshop was held on 10 March on the farm of one of the participants. Main goal was to discuss possibilities for collaboration between the Midden Brabant group and the water board. Main issues were water quantity and water quality. There was still a lot of tension because of the floods in2016 and the financial procedures afterwards. The water board presented a map of water quality, but the farmers asked for more and more fine-grained information. They were not only interested in N and P, but also in levels of pesticides. In addition, they wanted to see a more direct feedback between their actions and the water quality, and to have insight into the water quality of the smaller water bodies adjacent to their farmland.

The water board was not willing to explore the proposal of the farmers for an exchange between buffer strips and the ability to lease land from the water board. They did not want do favour the Skylark farmers over others. However, the water board is planning to change its land policy and to select land managers based on sustainable land management. What this encompasses, still needs to be developed. Skylark farmers can apply for this land, but they will not be favoured over other farmers that can show the desired sustainability requirements.

Instead, the farmers and the water board agreed to develop their collaboration further in the following directions:

- Exchange data and knowledge about farming and water system between farmers and water board: start a process of learning and joint field visits.
- Try out and monitor 'smart' buffer strips and reed filters on land of one of the Skylark participants
- Work towards a more robust water system (i.r.t. flooding and drought) and tailored water management, including areas that are allowed to flood against compensation.

10.3 Judgement on the process

The group of Skylark Midden Brabant arable farmers and the researchers hoped to have made more progress in working out a governance arrangement together with the Water board. However, the Water board was preoccupied with handling the aftermath of the storm water floods in June 2016, and was not willing to go along with the proposal of the farmers for using land as incentive for water quality measures. Nevertheless, there is now agreement on further collaboration. The limited time available for action-oriented research in Pegasus did not match with the pace of development in the stakeholder interaction in the case study.

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