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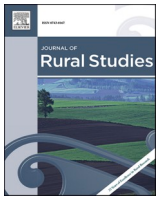

Towards more biodiverse agricultural landscapes: How to make species-rich grassland a desirable and feasible option for dairy farmers

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ABSTRACT

Species-rich grasslands are promoted by public and private actors for reasons of biodiversity, landscape amenity and animal health. There is little understanding of the considerations of farmers when they opt for or against species-rich grasslands. We held a workshop with 20 farmers and conducted in-depth interviews with 15 livestock farmers in Alblasserwaard - Vijfheerenlanden, a peat meadow landscape in the West of the Netherlands. In these discussions we made an inventory of opportunities and barriers that the farmers experience in terms of willingness, ability and support from society. In our analysis we distinguished four farming styles accommodating species-rich grasslands, which differ in the way willingness, ability and support from society are experienced by the farmers. Based on these findings, we make generic and farming style-specific recommendations for public policy and parties in the supply chain for effectively promoting species-rich grasslands among livestock farmers. We propose that a diverse public-private policy mix is essential to reach as many farmers as possible, acknowledging their heterogeneity and addressing their multiple needs.

1. Introduction

As grasslands in The Netherlands belong to the most intensively managed in Europe, it is not surprising that their biodiversity is a matter of concern (Batáry et al., 2010; Estel et al., 2018). The Netherlands is home to a relatively large and intensive animal production sector resulting in high nitrogen emissions with negative effects on biodiversity and water quality (OECD, 2023). The continued high pressure of nitrogen depositions on natural areas are in conflict with the European Bird and Habitat Directives and resulted in a 'nitrogen crisis', which requires a strong policy response against the background of fierce farmer protests (Erisman, 2021). At the same time, there are numerous public and private proposals and initiatives for restoration of farmland biodiversity.

For restoration of farmland biodiversity in The Netherlands and elsewhere, farming practices would need to change. This is not a simple matter. Management of grasslands, for example, is connected to a larger farm and food system that includes livestock management, technology, milk production, family income, markets and governance (Vermunt et al., 2022). All these aspects and more play a role when farmers are requested to change their grassland management for the benefit of biodiversity. The disappointing results in terms of participation of farmers and biodiversity restoration have given rise to the question whether a better understanding of behaviour could enhance the effectiveness of agri-environmental governance (Burton et al., 2008; Dessart et al., 2019; Mills et al., 2016).

Recently, behavioural aspects of sustainable grassland farming have received attention in research. Sweikert and Gigliotti (2019) studied values of grassland managers, including farmers, in relation to their land use decisions in the Great Plains of the U.S.A. Moroder and Kernecker (2022) found that Italian alpine grassland farmers perceive their role as farmers as both producers and as landscape stewards, while they perceive species composition mainly in relation to production qualities. Shortall (2022) identified development of skills and knowledge of farmers as important for stimulating species-rich grasslands in Ireland and related this to shifting cultural norms of 'good grassland farming'. Hammes et al. (2016) emphasized the differences between grassland farmers in North Germany in terms of attitudes and farming styles in relation to agri-environmental management. All these studies focus on a limited number of behavioural factors. In addition, while insight into behavioural factors is considered essential for the design of effective policies, the policy recommendations of most studies are very general.

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The purpose of this article is to contribute to an enhanced understanding of farmers' behaviour with respect to species-rich grassland, using a comprehensive behavioural model, and to translate that understanding into recommendations for governance. To this end we conducted a qualitative study in the peat meadow area of Alblasserwaard - Vijfheerenlanden in the Netherlands. Our research question is: *what is needed to motivate and enable dairy farmers to have and to expand species-rich grasslands?* We do not consider productive species-rich grasslands that were established by means of sowing a limited number of bred and often exotic plant varieties, but focus on (relatively) extensively managed grasslands with a high number of locally indigenous plant species, that mostly do not need sowing but emerge 'naturally' after a process of extensification. In general in the Netherlands, such grasslands are under agri-environmental management or leased by farmers from nature organisations (Schippers et al., 2012).

In the next section we will introduce our theoretical framework of governance, behaviour and farming styles. We will argue that changing farming practices at a large scale can only be achieved when for farmers all three behavioural conditions of willingness, ability and support are met, and when governance takes into account heterogeneity in farming. Then we will explain our qualitive and interpretative research approach, after which we will present the analysis of results of focus groups and interviews with livestock farmers in Alblasserwaard - Vijfheerenlanden in the form of four farming styles. In the Discussion we will reflect on the scope of changing grassland management practices in relation to farmer heterogeneity and on the possibilities for action by private and public actors. In addition, we will address the limitations of the study. In the conclusions we will answer the research question and give recommendations for further research.

2. Theoretical framework

The premise of this article is that choices regarding land management are made by individual farmers, and that their considerations are influenced by 'the system' in which they operate (Vermunt et al., 2022). This system includes the contracts with their supply chain partners and the bank, market demand, regulations and subsidies, the knowledge infrastructure available to them, their farming culture and the wider debate in society (Runhaar et al., 2017; Siebert et al., 2006). Much of this influence is a result of policy of private and public actors. For the complex interplay of steering by public and private actors – often also trying to influence each other – we use the word 'governance' (Armitage et al., 2012). Various governance arrangements have been described for -ultimately- influencing farmers' agri-environmental behaviour, often combining financial, regulating and communicative instruments (Runhaar et al., 2017).

'Behaviour' is studied in a range of scientific disciplines, including new institutional economics, sociology, behavioural economics and behavioural psychology. A large number of factors influencing behaviour have been identified, involving rational choice processes as well as more unconscious heuristics. In turn, various frameworks have been proposed to summarize these factors into a limited number of categories. Examples are 'dispositional, social and cognitive' (Dessart et al., 2019); 'motivation, ability, demand and legitimation' (Runhaar et al., 2017); 'willingness, ability and engagement' (Mills et al., 2016); and 'motivation, capability and opportunity' (Michie et al., 2011).

In this article we make use of the comprehensive framework of willingness, ability and support of Westerink et al. (2020a) (Fig. 1). This framework combines Runhaar et al. (2017) and Mills et al. (2016) and is very similar to Michie et al. (2011). Support (Westerink et al.) and opportunity (Michie et al.) both describe the influence of the environment on decisions of individuals. The framework of Michie et al. however, was proposed to describe behaviour of patients. We find the framework of Westerink et al. more suitable for understanding the behaviour of farmers. Support not only creates opportunity, but also provides legitimation.

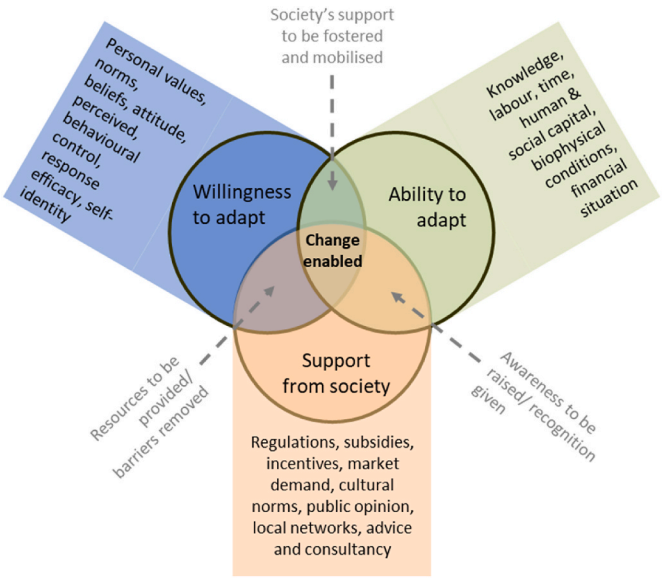

Fig. 1. Comprehensive model of environmental behaviour of farmers. Source: Westerink et al. (2020a).

Willingness of farmers to adapt refers to a range of factors that reflect the *desirability* of a certain choice and includes factors such as values, beliefs, norms, attitudes, motivations and identity. Well-known values that are important to many farmers are continuation of the family farm, autonomy and care (Farmar-Bowers and Lane, 2009; Schmitt et al., 2022). Beliefs include the conviction whether or not a certain action will have the intended effect (Wilson et al., 2014). Personal norms are notions about good or bad behaviour and are strongly related to notions of self-identity as a 'good farmer' (Burton, 2004; Lokhorst et al., 2011; Moroder and Kernecker, 2022). Attitudes can relate to for example affinity with nature – or fear of it (Ahnström et al., 2013). Motivations include various reasons for a certain choice, which may be simply the joy of competing with one's neighbour (Fleury et al., 2015).

Ability of farmers to adapt refers to a range of factors that reflect the *feasibility* of a certain choice and includes factors such as farm economy, location, farming system, technology, knowledge and skills. Farm economy sets strong limits to what farmers can and cannot do with species-rich grasslands (Wilson and Hart, 2000). Aspects of farm economy include availability of labour, income, costs and debts. There may be lock-ins, for example when farms are heavily financed, which constrain room for manoeuvre (Jongeneel et al., 2008; Methorst, 2016). In addition, room for manoeuvre can be constrained by the amount of land that the farmer can use. The location of the farm, in relation to landscape, soil and water conditions, parcelling and distance to urban areas, in part determines what is possible. This also relates to farming systems: intensive farmers often find it harder to integrate biodiversity than extensive farmers (Blüthgen et al., 2012; Santos et al., 2021). Integrating species-rich grasslands is related to farm management aspects such as flexibility, consistency and quality of forage (Magda et al., 2015). The availability of appropriate technology may be a bottleneck, as well as knowledge and skills that are needed to manage species-rich grasslands (Burton and Paragahawewa, 2011; Hecker et al., 2022; Shortall, 2022). In all of this, the perceived behavioural control makes a difference: it is not so much actual feasibility, but whether the farmer believes that he or she can do it, that determines whether a choice is made to take action (e.g. Darnhofer et al., 2005). Likewise, more than actual risk, perceived risk determines whether or not species-rich grassland is seen as an opportunity (Dessart et al., 2019).

Support from society – or the lack of it - has an influence on willingness and/or ability of farmers. Support includes market demand for farm products and services, subsidies, norms communicated by public or

private regulations, cultural norms of 'good farming' in the farming community, public opinion, social capital, consultancy and financing. Demand for ecosystem services and biodiversity-friendly food products through markets and subsidy schemes is both motivating and enabling (Bowman and Zilberman, 2013; Runhaar, 2017; Wilson and Hart, 2000). Rules can enable farmers by creating a level playing field and reducing risks for farm development (Segura et al., 2020; Sutherland, 2010). Regulations and certification schemes can communicate what is expected from farmers in terms of biodiversity and this way contribute to willingness, but rules can also discourage farmers to take action (Westerink et al., 2018). Farming culture can praise or condemn biodiversity-friendly behaviour, affecting willingness through the self-image of a farmer as a 'good farmer' (Burton, 2004; Westerink et al., 2021). In addition to the opinion of peers, also the opinion of the public is relevant to farmers as either discouraging or encouraging (De Krom, 2017; Van Herzele et al., 2013). Especially in local networks, social capital can be an important resource for farmers (Westerink et al., 2020b). Likewise, trusted advisors can have a major influence on both the farmer's attitude and his or her knowledge of the measure (Shortall, 2022). Financing – by banks or for example through crowd funding – can help or hinder biodiversity decisions (Migliorelli and Dessertine, 2018). This is similar to support from land owners offering favourable land lease conditions (Westerink et al., 2020a).

In line with Mills et al. (2016), Westerink et al. (2020a) state that change of behaviour can only be expected when all three conditions are met: the farmer is willing, able and supported. When willingness is low, awareness must be raised and recognition given to behaviour that is appreciated. When ability is weak, resources must be provided and barriers removed. When a farmer is both willing and able, but support is lacking, society's support must be mobilised and fostered.

What this means, however, is not the same for all farmers. Farmers differ in terms of personal preferences and skills, and farm development has a high level of path dependency (Methorst, 2016). Policy neglecting heterogeneity in farming is likely to be ineffective (Van der Ploeg and Ventura, 2014). The concept of farming styles is an attempt to recognize heterogeneity without making governance impossible. A farming style has been defined as a *coherent set of strategic notions* about the way in which farming should be practiced, as well as a *particular practice* - an internally coherent mode of farming, in the context of a set of particular relations between farming, markets and technology supply (van der Ploeg et al., 2009). Various typologies of farming styles have been proposed, including: environmental stewards, production maximizers, and networking entrepreneurs (Brodt et al., 2006); diversifying farmers, conventional farmers, businessmen and economical farmers (Swagemakers et al., 2017); cowmen, entrepreneurs, machine farmers and peasants (Van der Ploeg and Ventura, 2014); and traditionalists, idealists, modernists, and yield optimizers (Hammes et al., 2016). There is an analogy between the conditions for behaviour change: willingness, ability and support from society, and the dimensions of farming styles: norms/cultural repertoire, farming system and market/technology. We consider personal norms about good farming to be part of willingness. The farming system, because of its practical aspects, we consider part of ability. The influence of markets and technology we see as part of support from society. In this article, we therefore describe heterogeneity of farmers' perceptions of barriers and opportunities for species-rich grassland in terms of different coherent stories about willingness, ability and support; or farming styles.

3. Methods

This research was conducted as part of an interdisciplinary research project on species-rich grassland in the peat grassland area of Alblasserwaard - Vijfheerenlanden. The area is mostly unsuitable for arable farming and mainly has dairy farms and a few farms with suckler cows. In spite of decades of high participation in agri-environmental management and a very active agri-environmental collective,[1] the amount of species-rich grassland and the number of meadow birds in the area have declined (GAV, 2019). This is the result of land consolidation, drainage, grassland renewal and ample availability of animal manure. Species-rich grasslands are confined to nature reserves (1.3% of farmland in the area), organic farms (5.0%) and land under agri-environmental contracts (3.1%).

To answer the research question: *"what is needed to motivate and enable dairy farmers to have and to expand species-rich grasslands?"*, qualitative and interpretative methods were used. Such methods are appropriate when the research question involves perceptions and meanings and its answering requires understanding of various interpretations. For data collection we combined focus groups, in which in total 20 farmers participated, with individual interviews with 15 farmers, with an overlap of seven farmers. The focus groups allowed us to speak to more farmers and to find out whether they tell different stories in a group as compared to individual interviews. Participants for the focus groups were recruited through an invitation by email distributed by the agri-environmental collective among all its members in the area, and by the dairy cooperative DeltaMilk among its members in the area. Through the agri-environmental collective we recruited farmers who participate in agri-environmental management, in this area mainly species-rich grassland and meadow bird protection, including two female farmers and one organic farmer. Some, but not all DeltaMilk farmers also participate in the agri-environment scheme and are a member of the collective. One of the focus group participants did not have any species rich grasslands. All the others had grasslands that were managed for meadow birds, plant species diversity, or both, and/or grasslands in nature reserves.

The participants in the individual interviews were selected because they manage at least one extensive species-rich parcel. The parcels were selected by the research team based on species-richness, aided by the coordinator of the collective with his thorough knowledge of the area and its farmers (see Fig. 2). The farmers interviewed individually were all male, five were organic, and the farm size ranged from 25 to 120 ha (70 on average), and from 60 to 200 dairy cows (105 on average, young stock not included). The selected parcels were sampled in-depth for species composition, feed quantity and quality, and soil biodiversity. To understand the management of the parcels, how they fit into the overall farming system, and the relation to farm intensity, in-depth interviews were conducted in which quantitative and qualitative data were collected. Questions were added to these interviews about barriers and opportunities. As part of the interview, farmers were asked to indicate their agreement by dedicating a score between 0 and 3 to a number of potential reasons to have species-rich grasslands. The focus groups and the interviews lasted approximately 2 h. Stipends were paid to compensate for the farmers' time.

The focus groups were held in October 2020. Because of the limitations related to COVID, groups were kept small (4–6 farmers) and meetings between the groups were avoided. The focus groups were dedicated to discussing barriers and opportunities perceived by farmers in relation to species-rich grassland. During the meetings, the discussion was summarized on posters by the facilitator using the categories 'willingness', 'ability' and 'support'. In addition, a recording was made which was transcribed verbatim for a content analysis. The transcriptions were coded by one researcher, after several tests in the research team, including coding by two researchers, to create a joint

[1] Agri-environmental collectives are groups of farmers that implement the agri-environment scheme (AES) as an intermediary between the Province and the participating farmers (see Westerink et al., 2020b).

Fig. 2. Location of extensively managed parcels of 15 pilot farms in Alblasserwaard - Vijfheerenlanden.

understanding of the interpretations. As codes the various behavioural factors as categorized under 'willingness, ability and support' were used (Appendix A).

Interviews were recorded as well. Large parts of the interviews were not relevant for answering the research question of this article. However, statements throughout the interview could be relevant. Therefore, extensive summaries were made (not verbatim). These summaries were coded with the same coding scheme as the focus group transcriptions.

In the analysis, the focus group transcriptions and interview summaries were summarized in a table that was organized according to the codes, clustered in the categories 'willingness', 'ability' and 'support'. This allowed identification of important notions and narratives as well as comparison of the interviews and focus group results. The interviews were consistent with the focus groups. The interviewed farmers were then clustered into groups with similar narratives. This was the basis for the development of a farming style typology. After this, the summarized quotes in the table were coded again for the farming styles. The coded quotes were used to compile the narratives in the Results section. As real-life farmers rarely fit into a box, we found that most of the interviewed farmers combine elements of different farming styles. In the

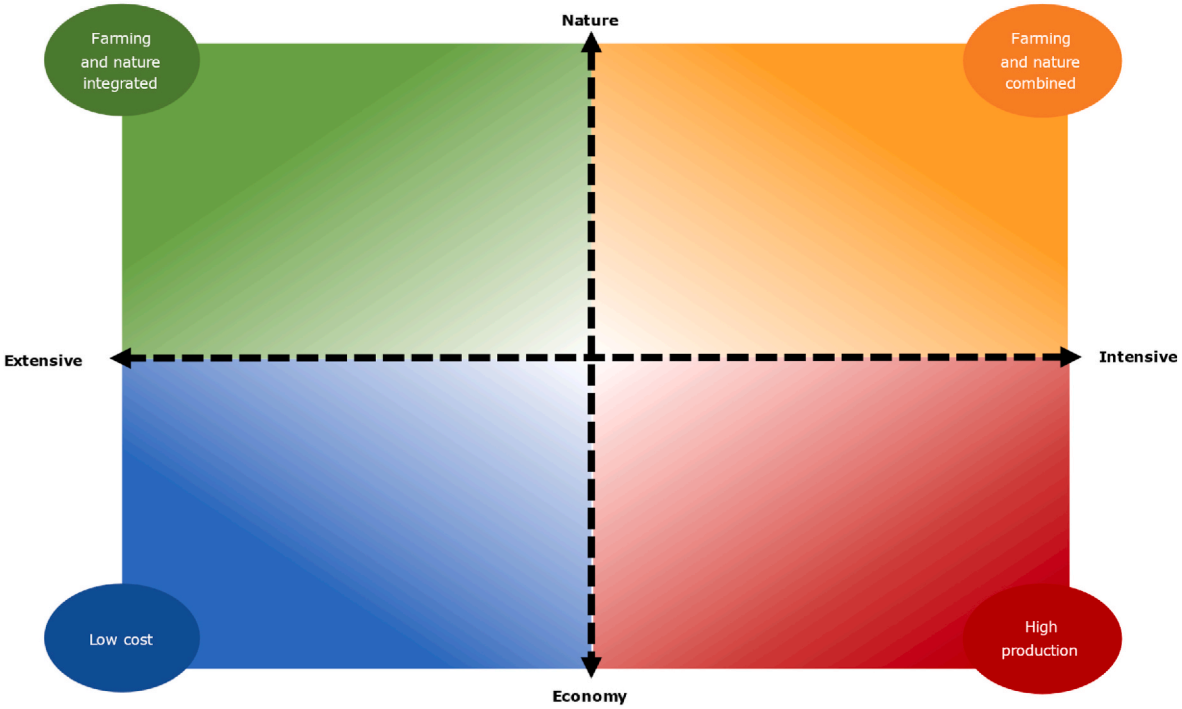

Fig. 3. Four farming styles defined by the position of farmers on the axes focus of farm strategy (economy <-> nature) and intensity (intensive <-> extensive). Source: the authors.

Results section this is illustrated in Fig. 4.

4. Results

The farming style typology was composed by means of two axes characterizing the main farm strategy: from a focus on farm economy to a focus on nature, and from intensive to extensive. Intensity is understood in terms of production per ha. The two axes span four quadrants (Fig. 3) representing farming styles: 'high production', 'low cost', 'combining farming and nature', and 'integrating farming and nature'. Within this framework, farmers can hold all positions: two farmers in the same quadrant will be different (see Fig. 4). We will now typify the four farming styles in terms of willingness, ability and support in the form of narratives and summarized in Table 1. After that, we will mark factors of willingness, ability and support that were not distinctive for farming styles, but apply to most if not all farmers that we spoke to.

4.1. Farming style 'high production'

4.1.1. Willingness

> "You have grasses and you have herbs, and in my perception you get good milk from grasses and not from herbs." (focus group 3)

A farmer striving for high production takes pride in a high milk production per cow and a farm that functions well economically. To that end, he will strive for high yields and a good quality of the grass in terms of nutritional value. Good grassland according to this type of farmer is a monoculture of Rye grass, evenly dark green, tidy, free of weeds and puddles. Managing grasslands extensively for biodiversity is experienced as wasting the land. Weeds are a nuisance and need to be controlled. This type of farmer will stress other sustainability contributions of grassland than biodiversity, such as sequestering carbon in the produced grass. He is interested in productive species-rich grassland which is achieved by sowing a limited number of specific herbs. 'Natural' species-rich grassland is experienced as a risk to milk production levels. Either this type of farmer will avoid species-rich grasslands altogether, or he will have small bits of it purely for financial reasons, such as a good payment for its management, and only on marginal lands. He may lease a small parcel in a nature reserve, for example. He will prefer making money with milk to making money with nature, but when he has nature, it must render economically.

In spite of a strong focus on production, this type of farmer can be fond of nature, especially meadow birds, but not in an "extreme" way. He is willing to make a small effort, as long as it is not too difficult and has limited impact on production. He is competitive, and this may be part of the fun of agri-environmental management. Having more plant species than the nature managing organisation, for example, proves that farmers are better land managers. This type of farmer likes a challenge, will be ambitious in whatever he takes on, and nourishes his autonomy and entrepreneurship. Organic farming would be a no-go: that would limit him too much.

4.1.2. Ability

> "With that poor land I cannot do so very much. A bit, but not much. (…) And when you have a lot of it, then you must feed it in winter as well. And then with my dairy cows I cannot … well you can always feed it but then your day production really …" (focus group 4)

A 'high production' farmer will see more barriers than opportunities for species-rich grasslands. He cannot use more than 15% species-rich grass. He feeds it to the young stock. He will rather not feed species-rich hay to the cows because he considers it of low quality, but he will sell it and buy good feed instead. Perhaps he will feed a bit of hay for reasons of animal health, but never in such amounts that milk production would decrease. He has a productive type of cow and considers a high milk production as a sign that the cows are well taken care of. A reason to tolerate species-rich grassland may be the possibility to apply more manure to the productive grasslands, as the farm average counts for the allowed amount of manure per ha. But he would still prefer to improve the fodder quality of the species-rich grasslands by applying manure there too. This type of farmer will calculate costs and benefits, with species-rich grasslands and grazing alike: some will keep the cows indoors for higher production levels, others will have them grazing because of the grazing premium of the dairy cooperative. Because of the high costs of land, species-rich grassland will feel like a waste. For the distribution of labour during the season species-rich grasslands are not a problem, as one cannot mow all the grasslands at once.

4.1.3. Support

> "The dairy factories must focus on valorising the products and not meddle with what we should produce and what we should do. With things like nature management they should not interfere at all." (focus group 3)

The 'high production' farmer will not have species-rich grasslands without a payment: this is a matter of principle. He does not experience much support from society: he feels not appreciated by the public. Regulations hinder him, they feel like interference with his farm management. Even the dairy cooperative and the retail try to influence farms and manipulate the prices with premiums. For getting a premium he would have to comply with rules and he does not like to be judged. He would prefer to be appreciated as a food producer through a good price for the milk. Now it seems as if everyone tries to push him in the direction of organic.

4.2. Farming style 'low cost'

4.2.1. Willingness

> "And I can earn a good income with it, so I am thinking I really do not need to grow bigger." (focus group 3)

A farmer with a 'low cost' strategy will take pride in having a good income from an extensive farm. She considers being smart and cost efficient as important skills of a farmer. Producing an extra liter is not important: revenue is. This type of farmer strives to optimise the system rather than growing bigger. A lower milk production is part of the deal. A 'low cost' farmer enjoys being a farmer. She likes to be independent and to farm in her own way. She is rather conservative and prefers 'old-fashioned' farmers' wisdom. Being creative with species-rich grassland is part of the skill.

Good grassland is resilient and keeps growing in dry or wet periods. The best grassland, according to a 'low cost' farmer, is old grassland which has not been renewed for a long time. This farmer will not produce nature for nature's sake: biodiversity is a by-product of this way of farming. The farm is leading, and birds benefit from extensive management. The farmer participates in the agri-environmental scheme mainly for financial reasons: it is a way to economically make the best of extensive farming.

4.2.2. Ability

> "So actually we went back from a farm with a considerable share of maize and a rather high milk production to more cows, but a lower milk production. And I think that our economic result is the better for it." I: "How come"? F: "Lower costs. We clearly chose for lower costs, yes." (focus group 1)

A low cost farmer has a low cattle density. Most or all of her grasslands are species-rich. She will avoid costs of hired labour, inputs and high investments. The price of organic feed and the limitations may

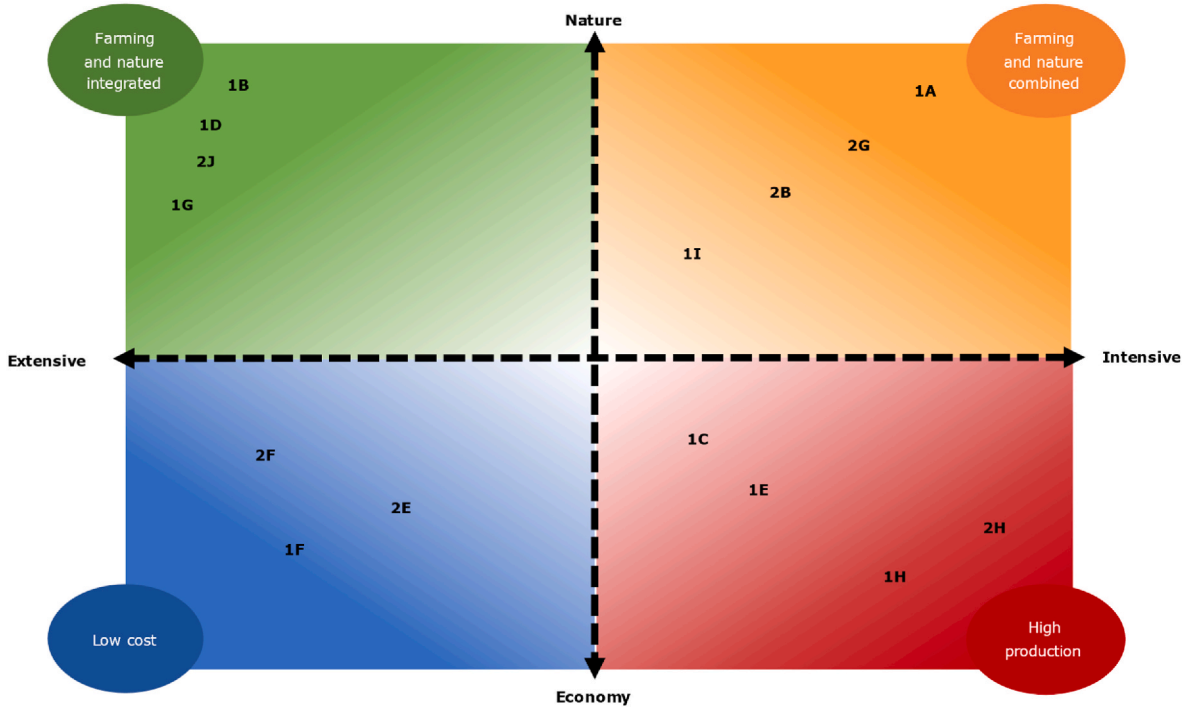

Fig. 4. Interviewed farmers positioned in the quadrant.

Table 1
Summary of farming styles that can implement species-rich grasslands in livestock farming in the lowland peat area of Alblasserwaard – Vijfheerenlanden.

	High production	Low cost	Farming and nature combined	Farming and nature integrated
Farm Philosophy	High milk production is priority	Good income by means of low costs	Milk production in combination with landscape management	Nature integrated into farming, organic
Farm characteristics	>15.000 kg/ha >2 LSU/ha Holstein Frisian cows Slurry and mineral fertilizer	7–10.000 kg/ha <2 LSU/ha Robust breed Limited inputs Much land Second job	12–18.000 kg/ha >2 LSU/ha Holstein Frisian cows Multifunctional activities	6–8.000 kg/ha <1.5 LSU/ha Robust breed Solid manure, no mineral fertilizer Multifunctional activities
Willingness to implement species-rich grassland	Financial motivation; Good grassland is monoculture English rye, green and tidy and can be cut every 4 weeks; Species-rich grasslands are preferably sown with a productive mixture	Economic motivation/ optimizing; Good grassland is permanent grassland; Natural species-rich grassland; Biodiversity as result of farming	Social responsibility; depending on aim of field productive grasslands or natural species-rich grassland; Interest in biodiversity (mainly birds), experimenting and learning	Self-evident/part of identity; Working with nature; Good grassland is permanent, natural and species-rich, resilient to drought
Ability to implement species-rich grassland	Limited: <15% only on bad land (or hired land); Risk for production level; Only when it is financially attractive	Fits in whole system; easy to manage and not much work; Cheap land in nature reserve; Attractive with payment	25–35%: Diversity in animal diet; Good species-rich hay has value; Balance between sites; Agri-environmental payment and/or lease of land in nature reserve	Species-rich is the basis for all fields; Balancing grasslands, cattle and available manure; Makes use of nature; Organic milk prices make up for lower production.
Support from society to implement species-rich grassland	Feels hindered by regulations and lack of appreciation; Participates in AES[a] to make bad land render.	Soloist; Does not like controls; Experiences lack of appreciation; Participates in AES.	Appreciates farmer collective and collaboration; Participates in private sustainability initiatives and AES	Good collaboration with nature organisations; Participates in AES; Feels appreciated.

[a] Agri-Environment Scheme

discourage this farmer to become organic. She has a robust type of cow which is grass fed and is grazing outdoors as much as possible. Milking in the meadow may suit this farmer because of efficiency of labour and low investments. Species-rich grassland is quite easy to manage, without much work, it is 'lazy land'. By mowing early, the farmer steers for good quality grass, without needing artificial fertilizer. Good quality hay is appreciated and is best made of species-rich grass. Having some diversity makes life easy for the farmer and the cows: when cows can choose what they eat both in the meadow and in the stable, they take what they need. Most land will be under some form of agri-environmental management. The agri-environmental payments are an important source of income. Managing land in nature reserves is attractive also, because it is cheap land.

4.2.3. *Support*

> "In that Planet Proof scheme of FrieslandCampina you have to go to a yield of 14–15.000 kg dry matter, and I think you have to farm as intensively as possible, otherwise your circular KPIs[2] do not work". (focus group 2, farmer criticizing one of the supply chain sustainability programmes)

[2] Key Performance Indicators

The 'low cost' farmer considers the agri-environmental payments as justified. However, she hates obligations, bureaucracy and the many controls that come with participation in the scheme. As a soloist, she values her autonomy, but to be cut on the subsidy would have big consequences for her. The 'low cost' farmer does not feel appreciated by the dairy companies because the criteria of the sustainability programmes poorly represent extensive farms. As a result, she does not feel appreciated by society. She is critical about the short term land lease contracts of and the lack of acknowledgement by nature management organisations. Also advisors are not very welcome, as they are mainly after their own revenue: she prefers to find her own way and not to spend money on consultants.

4.3. Farming style 'farming and nature combined'

4.3.1. Willingness

> "I am a real nature lover, I studied Forest and Nature Management. And from there I ended up on the dairy farm, so I really like the combination. I enjoy nature, so I like to be able to combine it with my farm." (focus group 1)

Farmers with the farming style 'farming and nature combined' believe that food production and biodiversity can coexist in rural areas. They are not extremely production focussed and in principle have a positive attitude towards extensification, for example through reducing inputs. These farmers strive for a high milk production as well as much biodiversity and dedicate different parts of their land to these aims. They have highly producing grasslands as well as (very) extensively managed species-rich grasslands, the latter mainly on more remote and wet sites. Good grassland according to this type of farmer is dominated by Rye grass, but needs to be robust and still can have some diversity of species. 'Real' species-rich grassland according to this farmer is extensive grassland, of the type that in the past used to be common on the remote parcels. The combining farmer strives for balance in his farming system. Circular farming has his interest, in terms of having sufficient land to produce the grass for his cows and to place the available manure. He speaks of feeding the soil with animal manure and keeping soil life happy. He wants to contribute to society, for example by grazing the cows outdoors and by taking care of meadow birds. He enjoys having birds and rare plant species and is interested to learn more about them. He is also learning from experience and aims to extend the nature management. He is attached to his land and finds animal welfare important. Pleasure in work is important to him. The 'combining' farmer is satisfied when it all fits: when there is enough land for the manure from the cows, when the meadow birds can sustain themselves, and as long as there is a net income. He is proud of his biodiversity results.

4.3.2. Ability

> "And then you see that it goes well, there is a return, and you have a business model this way!" (focus group 1)

The species-rich grasslands of 'combining' farmers are usually under a management scheme. This means that they are mainly mown later in summer and rarely grazed. From this land, the best possible product is hay. The 'combining' farmers value variety in the animals' diet. 'Structure' in the form of hay is important for balancing high protein content in fresh Rye grass and is therefore important for animal health. In addition, a variety of plants comes with diversity of nutrient contents. Hay that is harvested in the right way (under dry circumstances) smells good, is tasty and the cows love it. Yet, the 'combining' farmer does not expect magic from species-rich grass for animal health. And feeding too much of it to lactating cows will reduce milk production. Therefore, most hay is fed to young stock and 'dry cows'. Another reason to appreciate species-rich grass and hay is that it improves the quality of the manure. Hay from very extensive grasslands in nature reserves could be useful to replace straw in the stables. A 'combining' farmer can integrate up to 25–35% species-rich grass into his farming system. The balance should be kept, otherwise the milk production would drop too much. He has a productive type of cow. To cover the costs incurred and income forgone of species-rich grasslands compared to regular grasslands, a lower lease price for land in nature reserves and a payment for agri-environmental management on farmland are necessary. Some 'combining' farmers however have such good experience with integrating species-rich grasslands into their farming system, that they would keep some even without a payment.

4.3.3. Support

> "I deliver to DeltaMilk. And the nice thing is, then there is a programme and I can join without having to do anything extra. So then you see: this is what is wanted. So the support from society is very big in this way." (focus group 1)

The 'combining' farmer has a positive attitude towards society. In the end it is the consumer who decides what agriculture looks like and the farmer should anticipate on her wishes. Much of his species-rich grassland is leased from nature-managing organisations with whom the farmer generally has a good relationship at the local level – the central level is another matter. He finds bottom-up contribution to nature management important. He is proud of positive forms of collective action by farmers, such as the agri-environmental collective that organises the agri-environmental management. In addition, he appreciates the collaboration with nature volunteers.

As conventional farmer, the 'combining' farmer can participate in sustainability programs of the dairy cooperatives and retailers. He is content that he can receive a premium on the milk price for species-rich grassland because he participates in the agri-environment scheme. The stacking of public and private payments is economically interesting and feels as real appreciation. Long term agreements with good payment -public and/or private - are seen by this type of farmer as essential to be able to manage species-rich grassland. However, the systems for compliance and control should not be too difficult.

4.4. Farming style 'farming and nature integrated'

4.4.1. Willingness

> "Yes, engagement with the climate, with nature, actually. Moving along with nature." (focus group 4)

Farmers with the farming style 'farming and nature integrated' see species-rich grassland as an indispensable and self-evident part of their farm. Farming and nature are one comprehensive whole, a 'system', of which species-rich grassland is the core. Because everything on a farm is interrelated, the whole way of working needs to be adapted and a lower production level of milk is accepted as part of the game. Most of them are organic farmers, and they consider nature management as suiting with organic. For an 'integrated' farmer, working with nature is part of who she is. An integrated farming style 'fits' with her as a person, as well as with the natural conditions. It is about going along with natural processes and the rhythm of nature. She will consider wildlife in her management decisions. It makes her proud when it all comes together and nature is really a part of the farm. Farming this way requires a special skill and expertise. The farmer is an independent thinker. She enjoys to experiment and to make something work that others deem impossible. Working like this is rewarding: it is a sport. When her biodiversity results are better than the nature managing organisations, she will be particularly proud. Seeing results is stimulating.

Good grassland according to her is well-maintained old grassland with a dense sod and a high diversity of indigenous plants that belong to the region. The soil has a high organic matter content and healthy soil life. Species-rich grassland is experienced as more resilient. The

'integrated' farmer (like the 'combining' farmer) refers to local agricultural tradition to stress the interdependency of farming and nature. In other words: species-rich grasslands belong to the area. They are part of an ecosystem in which everything has a function: native species-rich grasslands provide habitat for insects which are food for birds. In addition, young birds need the more open grass structure of species-rich grasslands to be able to move around. According to this type of farmer, species-rich grassland can only be achieved through extensification: without that, sowing herbs will have no permanent result.

4.4.2. Ability

> "My yield is as good as that of farmers who work with artificial fertilizer. Only it grows a bit slower in spring. (…) And you see that in a dry summer the grass grows a bit less, but a number of herbs continue to grow well. You have a balanced growth of the grass." (focus group 4)

An 'integrated' farmer adapts the farm to the land, works with what is there and makes the best of it. She strives for a balance between the land and the number of cows. As most if not all of the grassland of an 'integrated' farmer is species-rich, the 'integrated' farmer has chosen for a robust type of cow. She trusts that the cow eats what it needs from the diverse grassland and believes that the species-richness is good for animal health. The grasslands may be less extensive than the species-rich grasslands of 'combining' farmers, because 'integrated' farmers have species-rich grasslands as basis for milk production. Yet, also an integrated farmer will strive for variety in grassland productivity to have means to steer in her feeding management. She may also lease extensive grasslands in nature reserves. This type of farmer has a stable in which farmyard manure is produced and she is convinced that this is better for the soil and for biodiversity. 'Integrated' farmers can be more relaxed: it is easier to work with than against nature. This saves on inputs, labour and investments – although weeds are contained through manual labour. The higher price for organic milk is an important part of the business model. In addition, the integrating farmer participates in various packages of the agri-environment scheme. The agri-environmental payments are not a goal in itself, but are needed to make things possible.

4.4.3. Support

> "We produce for a different milk price and then it is possible." (focus group 4)

'Integrated' farmers have a positive attitude towards society and do not identify with complaining farmers. They like to look ahead and aim to adapt to what society requires. Farms have a role in society. Delivering 'services' will become more important, these farmers expect. An 'integrated' farmer welcomes people on her farm and experiences positive reactions from citizens. She is content with the agri-environmental payment and is positive about the agri-environmental collective. An 'integrated farmer' has a good collaboration with the nature managing organisations. She would like to have more long-term contracts in the agri-environment scheme and in leasing land in nature reserves, to be able to reach biodiversity goals. In addition, she would prefer to be able to use her skill and knowledge in the management. In that sense she can be critical about the current rules of nature and agri-environmental management. For example, the rigid mowing dates for the protection of meadow birds prevent tailoring management to the periods that herbs and grasses set seed.

4.5. All farming styles

Analysis of the focus groups and interviews yielded the following factors that did not fit into one of the four farming styles.

4.5.1. Willingness

> "Management in mosaics is extremely important of course. Because when you look at the meadow birds, it is enjoyable when the chicks hatch, but when they are eaten three days later, then what have you been doing it for?" (focus group 1)

Taking care of meadow birds is for many farmers a reason to engage in agri-environmental management and to have species-rich grassland. Predation of eggs and chicks by foxes, crows etc. is experienced as demotivating after all the invested effort and care. A negative attitude towards weeds is common among all types of farmers. Some plant species are poisonous for the cows, other species have little nutritious value but can proliferate. However, farmers with much knowledge of species and management of species-rich grasslands are less fearful of weeds than others.

All farmers want a good future for their farm. They want a well-functioning farm, with healthy cows, and sufficient income for their families and personnel. Family values are important: the family is an important reason to do the work and they refer to previous and to next generations. All farmers are proud to be a farmer and do their best, although their self-identity (how they see themselves as a good farmer, and what a good farmer is) varies.

4.5.2. Ability

> "And I have a piece of land, grassland, that is just at the back there, so that is where I do the management." (focus group 2)

The location of many species-rich grasslands in the area relates to the history of the landscape: often they are the more remote fields with wet conditions. Farmers agree that extensifying grasslands takes time, especially on the rich peat soils. It takes some years of mowing and removing the hay, without applying manure, for the diversity of plant species to return and to restore bird habitat. All types of farmers have poor experiences with sowing herbs in productive grasslands: the herbs do not sustain on the peat soils and disappear after a few years. All types of farmers appreciate hay as part of the ration (although in varying amounts), and stress the skill needed to make good hay. They want to learn and develop skills for management of species-rich grasslands.

For many farmers, selling mown grass or hay is part of the business model. This is only possible for farmers who have sufficient land, or the sold grass is compensated by buying good quality feed. Currently, there is demand for hay with owners of horses and sheep.

4.5.3. Support

> "Another opportunity would be a higher budget for the collective. That would stimulate agri-environmental management. The incentive would just be a bit bigger." (focus group 3)

More stable and long-term policy would help farmers to make plans for incorporating (more) species-rich grasslands into their farm strategy. A fair payment for their efforts, and being allowed to make money with nature management, would be experienced as legitimate appreciation. The idea that a public payment for environmental management is 'state aid', is rejected. Also very common is an antipathy against too many regulations, reducing farmers' freedom and impacting on their sense of autonomy.

The farmers feel little criticism from colleagues for their species-rich grassland. Agri-environmental management is normal in the farming culture in this region.

4.6. Nature or economy?

We used additional methods to explore the intensity of the farms and the relative importance of 'nature' and 'economy' in farm decisions. In

the interviews, the 15 livestock farmers were asked to score the importance of a number of factors in their decisions regarding species-rich grassland in terms of values between 0 and 3. A score of 0 meant 'not at all important' and 3 meant 'very important'. The factors included 'importance for nature', 'personal interest' and 'farm economy'. In Fig. 5, the score for 'farm economy' was subtracted from the average score of 'personal interest' and 'importance for nature'. A result >0 indicates that for this livestock farmer, the aspect of 'nature' is more important than the economic aspect in decisions regarding species-rich grassland. For the two most intensive farmers in the sample, farm economy is more important than the importance of nature. For all organic farmers, nature is more important than farm economy. Interestingly, however, this motivation for nature applies to most participating farmers, including rather intensive ones.

Fig. 6 shows that extensive farms have more species-rich grassland than intensive farms: between 40 and 60%. The share of species-rich grassland was determined based on the hectares under the agri-environmental scheme in relation to the farm grassland total. In reality, organic and extensive farms may have up to 100% species-rich grassland because they manage the grasslands that are not enlisted in the AES also without artificial fertilizer. However, also most participating intensive farms have around 20% species-rich grassland. The more intensive farmers vary in their main motivation, while the more extensive (mainly organic) farms are motivated for nature more than economy when they make decisions about species-rich grassland.

5. Discussion

5.1. Possibilities to shift

We distinguished four farming styles that differ in the way that willingness, ability and support from society in relation to species-rich grassland are experienced by the farmers. Although their farming styles differ, all interviewed farmers and most of the farmers in the focus groups in some way have integrated species-rich grassland into their farming system, many since long. All interviewed farmers state that they cannot integrate more species-rich grassland into their current farming system. This could give the impression that the farmers are not open to change. However, many of the farmers report changes in the past: leasing extra land in the nature reserve or conversion to organic. Some farmers, particularly those 'combining farming and nature', would be interested in extensification. This would mean a reduction in milk production and/or an addition of land. Conversion to organic farming could be a way to complete the business model. Also for 'low cost' farmers a shift to organic could be possible. However, for very intensive farms such a transition would not be feasible: their whole farming system (technology, breed of cow, feeding strategy, etc.) and their business model are based on high milk production from a limited amount of land. Shifting from 'high production' to 'farming and nature integrated' would not only require a different farm philosophy, set of farming skills and new investments; it would either imply access to large amounts of cheap land, or the relieving of debts with the bank. Shifting from 'high production' to 'combining farming and nature' would be more feasible.

Therefore, feasibility of a shift towards a farming system that can incorporate more species-rich grassland depends on the starting position. The experience of the participating farmers shows, that these are often stepwise or gradual developments. Farmers start participating in low-threshold agri-environmental measures, on invitation of the agri-environmental collective or inspired by a neighbour, enjoy the experience and the collaboration, see the results, expand their agri-environmental management, and start looking differently at their land (see also Westerink et al., 2021). One of the farmers experienced a real 'conversion' after realizing the environmental damage of conventional farming and made a radical shift to organic farming (accepting the economic risks). This was not long after taking over the farm from his parents. A new generation on the farm offers opportunities for changes in management (Sutherland et al., 2012). However, this can also be in the opposite direction: the son of one of the 'combining' farmers in this study seems to prefer a 'high production' farming style.

We witnessed a gap between the 'integrating' farmers and the others in terms of the amount of species-rich grassland that they could integrate. This is in line with previous research among farmers in the Netherlands that up to 20–25% agri-environmental management can be integrated without large changes to the farming system, but above that, higher payments are needed to compensate for the lower production (Duinkerken et al., 2005; Remmelink et al., 2007; Sanders et al., 2013). This explains why all the 'integrated' farmers in our study are organic farmers.

The results show that farmers with very different farming systems and opinions about 'good grassland farming' can work with species-rich grassland, although on aspects their needs differ. This is an important insight for the design of governance arrangements.

5.2. Governance: possibilities for action by public and private actors

Governance is needed by public and private actors to support farmers to change their practices on the scale that is needed for biodiversity restoration. Governance promoting species-rich grassland will be more

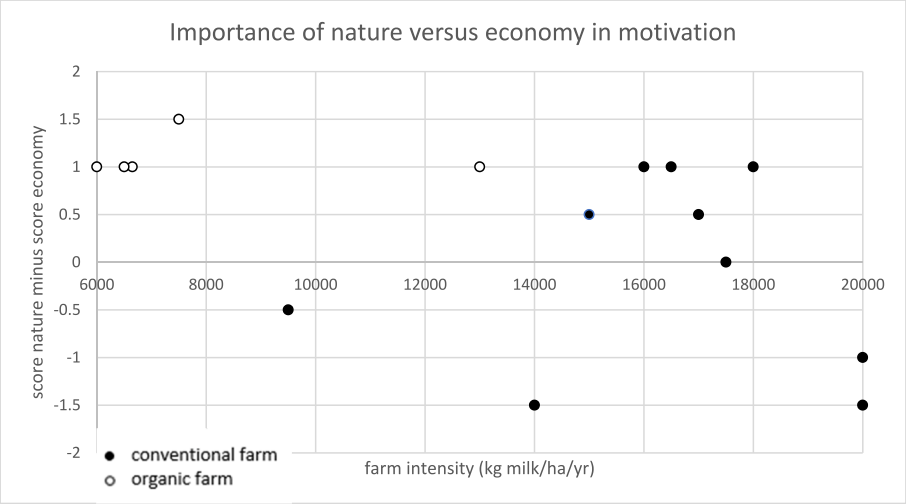

Fig. 5. Importance of nature versus importance of economy related to farm intensity.

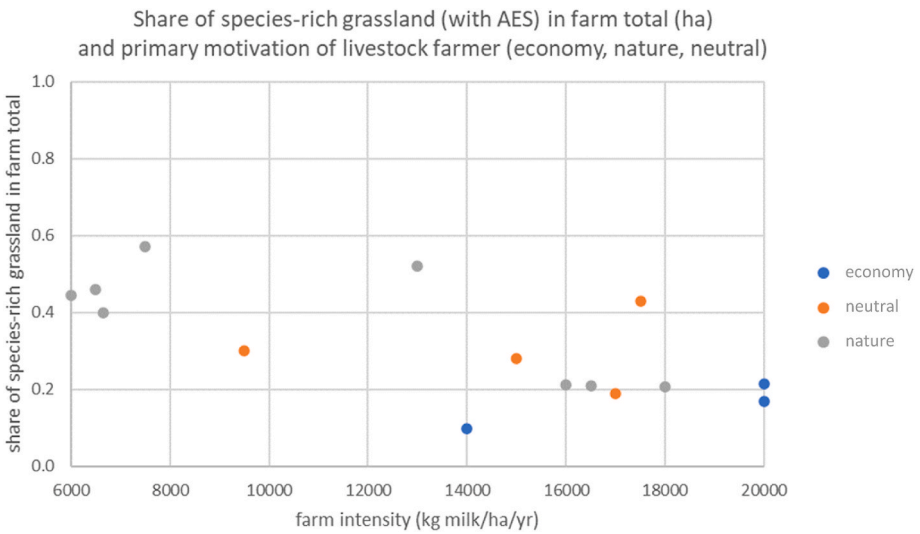

Fig. 6. Farm intensity related to share of species-rich grassland on the farm, and primary motivation of livestock farmer.

effective when the opportunities and barriers that farmers perceive are taken into consideration. Effective governance actions should increase farmers' willingness and ability to implement species-rich grassland, as well as target influential actors such as supply chain companies and the agri-environmental collectives. In addition, we propose that taking into account farmer heterogeneity will be more effective than a one-size-fits-all approach. Moreover, farmers who are taking their first steps into managing species-rich grassland practices need different interventions (such as awareness raising) than farmers with much knowledge and experience. The latter group benefits from actions enabling them to maintain and perhaps upscale their activities (de Lauwere et al., 2022).

To aid the design of effective governance approaches, we here tailor policy recommendations to the four farming styles that we distinguished. In addition, there are policy options that could benefit all types

Table 2
Possibilities for action by public and private actors stimulating extensive species-rich grasslands addressing willingness and ability of farmers and support from society, for the four identified farming styles, and general options.

	High production	Low costs	Farming and nature combined	Farming and nature integrated	All types of farmers
Willingness to implement species-rich grassland	• Communication: 'feeding a bit of species-rich grass does not harm milk production levels'. • Communication: 'species-rich grassland provides license to produce'.	• Communication: 'species-rich grassland is easy and low cost'. • Acknowledgement of the skills of an extensive farmer.	• Communication: 'species-rich grassland is appreciated by society and benefits biodiversity'. • Promotion of circular farming. • (Subsidy for) study groups, learning networks and living labs. • Participatory biodiversity monitoring. • Acknowledgement of biodiversity results.	• Communication: 'species-rich grassland is resilient and core to working with nature'. • Participatory biodiversity monitoring. • Acknowledgement of contribution of farming to biodiversity. • Acknowledgement of the skills and ecological knowledge of an integrated farmer.	• Communication: 'species-rich grassland belongs to future-oriented farms'. • Education about plant species, characteristics and management (incl. weeds). • Allowing management of predators of meadow birds.
Ability to implement species-rich grassland	• AES payments to make bad land and field edges render. • Lease out land in nature reserves. • Information about health benefits for cows, especially in relation to reduction of vet costs. • Information about risks and weed management.	• AES payments. • Lease out land in nature reserves and other publicly owned land for low price. • Knowledge of ecological benefits of extensive farming, and low cost technologies.	• AES payments. • Lease out land in nature reserves. • Knowledge of diet and animal health aspects. • Ecological knowledge. • Knowledge about improving manure quality. • Incentives for extensification, e.g. devaluating land.	• AES payments. • Lease out land in nature reserves and other publicly owned land for low price. • Organic milk price.	• AES payments not only for established species-rich grassland, but also for development (a period of extensification).
Support from society to implement species-rich grassland	• Simplify rules of subsidy scheme. • Media attention to highly producing farmers who take biodiversity actions.	• Less controls. • KPIs in supply chain initiatives appreciating extensive farming. • Long-term AES and land lease contracts. • Public appreciation for the contribution of extensive farming to biodiversity. • Network of low cost farmers.	• (Financial) support for agri-environmental farmer collectives. • Stimulate local networks with nature managers and volunteers. • (Incentives for supply chain parties to) accelerate environmental premiums on milk price. • Allow stacking of public and private payments.	• Nature organisations seeking collaboration. • Stimulate development of niche markets (organic, local). • Policy support for organic farming. • Long-term AES and land lease contracts. • Support from volunteers in weed management.	• Long-term policy for biodiversity and sustainable agriculture. • Stop labelling public environmental payments as 'state aid'.

of farmers. We summarized possible actions by public and private actors for stimulating species-rich grassland in Table 2. In line with Mills et al. (2016) and Westerink et al. (2020a) we propose that effective governance would entail a policy mix with communicative, financial and regulative instruments, and public as well as private actions, to support as many grassland farmers as possible.

The four farming styles represent different 'good farmer' identities. Willingness will increase when governance actions stress and strengthen these identities. Communicating economic rationality will appeal to 'high production' and 'low cost' farmers, while incentives for learning, experimenting and appreciation will find fertile ground with 'combining' and 'integrated' farmers. 'Combining' and 'high production' farmers will most likely respond positively to messages that species-rich grassland can be combined with productive grasslands. 'Low cost' farmers will want to hear that it can be cost saving and sustainable, while 'combining' and 'integrated' farmers may be susceptible to arguments that it is appreciated by society and that it benefits biodiversity. All farmers will be motivated by acknowledgement of their skills and biodiversity achievements. All types of farmers could be helped with education on plant species, their risks and benefits, and management.

Governance actions to increase the ability to implement species-rich grassland should remove perceived obstacles such as decline of income or availability of technology, knowledge and skills. All farmers need some form of public or private payment to compensate for costs and income forgone, but this will be appreciated most by the 'low cost' and 'high production' farmers. In addition, 'combining' farmers may be interested in incentives for extensification of their farm. 'Low cost', 'combining' and 'integrating' farmers are keen to lease land in nature reserves, but especially for 'low cost' and 'integrated' farmers a low lease price is important. For 'high production' farmers knowledge on limiting the risks associated with species-rich grassland is key, while 'low cost' farmers can be supported by knowledge about low cost technologies. Knowledge on the value of species-richness on animal diet and health will help 'combining' farmers, where organic milk prices will attract the interest of farmers 'integrating farming and nature'. All types of farmers could be helped with subsidy schemes supporting the period of developing species-rich grassland through extensification of regular land.

Compared to the other types, 'high production' and 'low cost' farmers seem the least interested in support from society. They need an economic compensation, but prefer to be left alone as much as possible. For 'high production' and 'combining' farmers, a combination of private and public payments is attractive. Public actors could try to stimulate private actors such as supply chain companies to provide payments too. 'Low cost' farmers can be helped by giving appreciation for their way of farming, setting up networks of low input farmers where they can find recognition among peers, and by relaxing controls of the agri-environmental scheme. This group of farmers will also be sensitive to stability in support, for example through long-term land lease and agri-environmental contracts. The 'combining' farmers seem most interested in learning about species-rich grassland and extensification. They can be supported by study groups and joint experimentation for example organised by the agri-environmental collective. Public policy could stimulate this. 'Integrating' farmers can be supported with long term contracts and with promoting a market for niche products and creating conditions for labelling. There is an important role for private and semi-public actors such as the agri-environmental collective, the dairy co-operatives, advisors, nature managing organisations and citizen groups in influencing the behaviour of the different types of farmers. Their support in terms of appreciation, payments, knowledge and forms of cost reduction is greatly needed to strengthen willingness and ability of farmers to take care of more species-rich grassland. All types of farmers would benefit from long-term policy creating clarity for the future of agriculture and the commitment for restoration of biodiversity. In addition, it would help if farmers can be properly rewarded for their environmental efforts, without a 'state aid' label hindering business models and communicating that nature is not a valued farming activity.

At the least, a public-private policy mix for stimulating species-rich grassland should entail sufficient and agri-environmental payments complemented by private payments, support for organic farming and market development, options for reducing the costs of land, education, appreciation, acknowledgement of farmers' skills and knowledge, targeted communication, support for farmer groups, and long-term contracts and policy.

5.3. Added value of the research

In this article we have produced a typology of farmers that in one way or another integrate extensive species-rich grassland into their farming system. To our best knowledge, we are the first to develop a farming style typology based on a comprehensive framework of behavioural factors. Our typology is complementary to those of others. Which typology suits best, depends on the purpose of the study. Hammes et al. (2016) categorized interviewed farmers according to predefined farming styles to demonstrate a relation between farming style and attitude towards nature conservation. In our conceptualisation, attitude towards biodiversity is part of the farming style narrative. The typology referenced in Van der Ploeg and Ventura (2014) was based on an analysis of grassland (dairy) farming in another peat meadow region of the Netherlands (Noardlike Fryske Wâlden) with farming styles distinguished by the axes 'production' and 'development' (van der Ploeg, 2008). It would have served to classify the farmers in our case study region in a general sense. The 'entrepreneurs' resemble our 'high production' farmers and the 'peasants' our 'low cost' farmers. This makes sense, our axis 'extensive – intensive' being about production. However, our typology is specific for understanding the integration of species-rich grassland. We therefore chose a 'nature - economy' axis instead of the 'development' axis of Van der Ploeg et al. (self-sustained - mobilisation of external resources).

In relation to grassland management in the USA, Sweikert and Gigliotti (2019) developed four 'Land Use Value Types' on 'nature--centred' and 'human-centred' axes: 'nature first', 'humans first', 'interconnected' and 'disconnected'. They used quantitative methods to dedicate over 9000 landowners to the four types and to classify their motivations and behaviours. Their types are similar to ours ('nature first' resembles 'integrated', 'humans first' resembles 'high production', 'interconnected' resembles 'combined'), but 'disconnected' is unlike our 'low-cost'. Similar to our study and in line with Hammes et al. (2016), Sweikert and Gigliotti recommend to tailor communication strategies and policies to the different types.

Our policy recommendations, based on a broad range of behavioural factors, are in line with those of Shortall (2022), who recommended the facilitation of a definition of good farming which would support species-rich grasslands. Her recommendations include emphasizing the cost-saving aspect of low fertilizer use, peer-to-peer deliberation, and involving not only farmers but also other stakeholders in the development of conceptions of good farming. In our study, cultural norms regarding 'tidy landscapes' were not considered as a limitation by the participating farmers, because of the tradition of agri-environmental management in the area. Therefore, apart from the general recommendation to support agri-environmental collectives – which were identified as key in shifting cultural norms by Westerink et al. (2021) -, we did not include specific policy options for influencing farming culture in the previous section. However, in other areas such policy may be very useful. For recommendations regarding such policy options, we refer to Shortall (2022), Burton and Paragahawewa (2011) and others.

Vermunt et al. (2022) concluded that the uptake of nature-inclusive practices such as species-rich grassland by Dutch dairy farmers is low and hindered by five main barriers: lack of financial incentives, limited action perspective of farmers, lack of a shared and concrete vision, obstacles to knowledge transfer and resistance of the regime. Our more in depth analysis incorporating different types of dairy farmers showed

that farmers perceive not only barriers but also opportunities, and that what is needed to integrate species-rich grassland differs for different farming styles.

5.4. Weaknesses of a farming style typology

Distinguishing a limited number of farming styles always implies a risk of describing caricatures and not doing justice to farmer individuality (Vanclay et al., 2007). We acknowledge that individual farmers will rarely recognize themselves completely in one of the styles. Also the statements of the farmers that we interviewed, were coded as belonging to more than one farming style. For that reason, we do not propose sharp boundaries between the farming styles. Rather than a devise to stereotype individual farmers, we see the farming style typology as a tool to design a public-private policy mix that will support as many grassland farmers as possible.

Our typology is based on farmers who do in some way integrate species-rich grassland into their farming system. Nevertheless, because of the great diversity of farming systems of the farmers that we interviewed, we are convinced that the opportunities and barriers that they mentioned are relevant to many livestock farmers in The Netherlands. This is important, because the majority of livestock farmers in The Netherlands currently do not have species-rich grassland.

6. Conclusions

This study aims to contribute to the effectiveness of agri-environmental governance, promoting indigenous species-rich grasslands, through a better understanding of behaviour of livestock farmers. Based on qualitative research among grassland farmers in the area of Alblasserwaard - Vijfheerenlanden we found many factors influencing decisions of farmers regarding implementation and management of species-rich grassland. We distinguished four farming styles with different narratives with respect to willingness, ability and required support from society. We translated these into options for generic and farming style-specific actions by public and private actors to stimulate species-rich grasslands and to remove barriers. We propose that a diverse public-private policy mix is essential to reach as many farmers as possible, acknowledging their diversity and addressing their multiple needs.

The great diversity of farmers who are able to implement species-rich grasslands – including those focusing on high milk production levels – gives hope. For restoration of biodiversity in this grassland landscape, it is not necessary that all farmers convert to organic farming. Of course, growth of the organic sector would help. But if all conventional farmers would integrate 15–30% species-rich grassland, biodiversity would get a tremendous boost. By stimulating organic farming as well as agri-environmental management by conventional farmers, environmental governance can align with the diversity in farmer identities. An important precondition would be the availability of sufficient funding for the agri-environmental scheme. In addition, we have seen that private schemes complementing the public ones are experienced by farmers as real support.

Our research took place against the background of much uncertainty about the future of livestock farming in the Netherlands as a result of the 'nitrogen crisis'. We must express our respect for the farmers who worked with us in such a potentially threatening context. However, if the national policy will promote extensification and provide more funds for agri-environmental management, this may facilitate the expansion of species-rich grasslands.

Further research could involve farmers who do not have species-rich grasslands and developing farming style typologies for other areas, biodiversity measures and farming systems. We recommend that those, like ours, will be based on comprehensive behavioural models. In addition, we recommend that future typologies take into account evolution of farms and the shifting of farmer perceptions, ambitions and identities as a result of learning and external influence.

CRediT authorship contribution statement

Judith Westerink: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Jan Hassink:** Conceptualization, Formal analysis, Investigation, Methodology, Validation, Writing - original draft, Writing - review & editing. **Marleen Plomp:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. **Jaap van Os:** Visualization, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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Appendix A. List of codes

Category	Code	Factor in farmer decision making	Translation
Willingness	W waard	Waarden/drijfveren/overtuigingen	Values/convictions
	W zelf	Zelfidentiteit	Self-identity as a 'good farmer'
	W pers	Persoonlijke normen	Personal norms
	W moti	Motivatie	Motivation
	W auto	Ondernemerschap/autonomie	Entrepreneurship/autonomy

(continued on next page)

(*continued*)

Category	Code	Factor in farmer decision making	Translation
	W voort	Voortbestaan (familie-) bedrijf, opvolgingssituatie	Continuation of (family) farm, succession
	W effect	Geloof in zin van maatregelen/effect, resultaten zien	Response efficacy/seeing results
	W houd	Houding/attitude	Attitude
	W inter	Interesse/belangstelling/plezier	Interest/fascination/pleasure
	W gewoo	Gewoonte	Habit
	W gemak	Gemak	Ease
Ability	K tijd	Arbeid/tijd	Labour/time
	K geld	Verdienmodel/inkomsten/kosten/transactiekosten	Business model/income/costs/transaction costs
	K invest	Investeringen	Investments
	K manoe	Manoeuvreerruimte/padafhankelijkheid	Room for manoeuvre/path dependency
	K grond	Grond/verkaveling	Land/parcelling
	K land	Landschap/waterpeil	Landscape/water level
	K tech	Technologie	Technology
	K kennis	Kennis	Knowledge
	K vaard	Vaardigheden	Skills
	K bedrijf	Bedrijfssysteem/inpasbaarheid	Farming system/incorporability
	K sockap	Sociaal kapitaal	Social capital
	K risico	Perceptie van risico	Risk perception
	K perc	Perceptie van eigen kunnen	Perceived behavioural control
Support	S subs	Vergoedingen en subsidieregelingen	Public payments and subsidies
	S prijs	Marktvraag in de vorm van hogere prijs	Market demand through price premium
	S markt	Normen gecommuniceerd door de markt	Norms communicated by the market
	S regel	Normen gecommuniceerd door regelgeving	Norms communicated by regulation
	S publ	Publieke opinie/maatschappelijke normen	Public opinion/public norms
	S cult	Culturele/sociale normen	Cultural/social norms
	S netw	Lokale netwerken	Local networks
	S erf	Advisering/invloed erfbetreders	Influence of advisors and other professional farm visitors
	S ond	Onderzoek	Research
	S bank	Financiering	Financing
	S verp	Verpachting	Land lease

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