

Combining Production with Preservation

– Livelihood Strategies and Innovations on Nature Pasture
Based Farms in Dalsland, Sweden

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Abstract

Biodiversity loss is a global problem that can lead to serious consequences. One of the most biodiverse habitats today is the product of extensive agriculture: semi-natural pastures, often termed High Nature Value (HNV) pasture. As farms become more and more intensive and specialised, these pastures disappear increasingly. This study aims to investigate how farmers can combine conservation of HNV pastures with profitable farming. In a qualitative case study in northern Dalsland, Sweden, ten pasture-based farms with HNV pastures have been studied. The case-study was conducted as a part of an action-oriented research and extension project, HNV-Link. The interview study has been complemented by participant observations at six visionary workshops about the future and background for HNV pastures with local actors in Dalsland. By applying a Sustainable Livelihood analysis, eight different types of activities and innovations were identified that supported the farmers' Livelihood strategies, together with resources and social factors that influenced and inspired the farmers in forming the strategies. The farmers' own motivation and values concerning the farm was an important factor, and three types of value orientation were used to discuss the differences: economical, traditional and ecological value orientation. Social networks with other farmers, either local or in other contexts, played an important role in spreading innovations and new ideas on how strategies could be formed to suit HNV pasture production, ideas that were later adapted to the specific conditions of the farm. Innovations and ideas for new entire strategies could come either from outside, from market initiatives or agricultural science, or from the farmers themselves. Depending on the outward and inward factors, the farmers innovated or adopted innovations that suited their farm. Important livelihood supporting activities and innovations were those related to utilizing pasture growth, diversifying the farm and using market solutions to receive payment for the ecological values of the production.

Keywords: Biodiversity, High Nature Value pastures, Livelihood, Innovations, Rural Development

Sammanfattning

Förlust av biologisk mångfald är ett globalt problem som kan leda till allvarliga konsekvenser. En av de mest artrika miljöer som finns idag är avhängigt av lantbruk: naturbetesmarker, ibland benämnda som HNV (High Nature Value) betesmarker. Allteftersom gårdar blir mer och mer intensifierade och specialiseringade så försvinner den här typen av marker i högre och högre utsträckning. Den här studien syftar till att undersöka hur lantbrukare kan kombinera bevarande av HNV-beten med lönsamt lantbrukande. I en kvalitativ fallstudie in norra Dalsland, Sverige, så har lantbrukare vid tio naturbetesbaserade lantbruk blivit intervjuade. Fallstudien genomfördes som en del av ett aktionsforsknings-orienterat forsknings- och rådgivningsprojekt, HNV-Link. Intervjustudien kompletterades av deltagande observationer vid sex visionerande workshops om framtiden och bakgrunden för värdefulla naturbetesmarkertillsammans med lokala aktörer i Dalsland. Genom att analysera lantbrukares försörjning genom analysverktyget Sustainable Livelihood Analysis, så identifierades åtta typer av försörjningsstrategier och innovationer. Analysen fokuserade på gården resurser tillsammans med sociala faktorer samt med trender, hinder och möjligheter i omvärlden som påverkade och inspirerade lantbrukare när de utformade försörjningsstrategier. En viktig faktor bakom utformandet av strategier var lantbrukarnas egna motivation och värdegrund. I studien användes tre kategorier för att diskutera skillnader i värdegrund: ekonomiskt, ekologiskt eller traditionellt inriktad värdegrund. Sociala nätverk var viktiga i spridandet av nya idéer om försörjningsstrategier och innovationer för naturbetesbaserad produktion, både nätverk med lantbrukare i närområdet eller i andra sammanhang. Nya idéer kunde komma antingen utifrån, från marknadsinitiativ eller från lantbruksvetenskap, eller från lantbrukarna själva. Beroende på faktorer utifrån eller inifrån gården så tog lantbrukaren till sig innovationer och anpassade till sin verksamhet, eller uppfann helt egna lösningar. Bland exemplen av aktiviteter och innovationer som utgjorde viktiga delar av gårdarnas försörjningsstrategier fanns både system som optimerade betestillväxten, diversifierade gården verksamhet eller marknadsbaserade lösningar som gjorde det möjligt för lantbrukarna att få betalt för de ekologiska värden som skapades av produktionen.

Nyckelord: Biologisk mångfald, Naturbetesmarker, Försörjningsstrategier, Innovationer, Landsbygdsutveckling.

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Introduction

“All aspects of human wellbeing depend on ecosystem goods and services, which in turn depend on biodiversity. Biodiversity loss can destabilize ecosystems, promote outbreaks of infectious disease, and undermine development progress, nutrition security and protection from natural disasters”

Dr Maria Neira, WHO Director, Department of Public Health, Environmental and Social Determinants of Health (Romanelli et al. 2015)

Biodiversity is the key to life on this planet, and loss of it is one of the major threats to human wellbeing. When picturing biotopes that are exceptionally rich in biodiversity, we tend to think of rainforests or coral reefs, but some of the most diverse biotopes existing today are actually a product of agriculture (Ekstam & Forshed 2000). One such example is semi-natural pastures, which is land that has been grazed by livestock and that has not been manured, ploughed or sprayed with pesticides in recent times. The term is relatively new, in traditional usage these fields would have been called outfields or simply pastures (Berg & Olsson 2000). The long history of grazing of these pastures has meant that competitive varieties have been kept back by constant grazing, and this has led to the unique diversity of species (Jordbruksverket 2016). To distinguish pastures with these extraordinary qualities from other pastures, the term High Nature Value (HNV) pastures can be used (Keenleyside et al. 2014). In one square metre of a Swedish HNV pasture there can grow as many as 40 different phanerogamic plants. In semi-natural pastures in Estonia as many as 60 different species have been found. In species diversity, this is very close to tropical rainforests (Berg & Olsson 2008, Wilson et al. 2012). However, as farms become more and more specialised and intensive, HNV pastures are increasingly being abandoned, and the valuable habitat disappears (Reidsma et al. 2006, Henle et al. 2008)

To sustain the biodiversity of HNV pastures there is a clear need of grazers. There are other advantages of using HNV pastures. Grass-fed management on nature pastures can also reduce the environmental impact of cattle production, since the animals mainly are fed by fodder grown on land that could not have been used to produce food for direct human consumption (Clay 2003). The methane emission from the ruminating animals is also in a higher extent compensated by the carbon

that is captured in the ground by using permanent pastures with low animal density than in intensive production systems (Mcginn et al. 2014). There are studies showing how a future environmentally sustainable dairy and meat production can be managed on extensive pastures. Röös et al. (2016) describes scenarios for a resource-efficient agriculture in Sweden, where the nature pastures are used as the main source of nutrition for cattle during the growing season. Environmental impact from this type of production would be considerably lower than from the present Swedish production (Röös et al. 2016).

The development in many parts of the world of disappearing HNV pasture based farms therefore leads to considerable losses of valuable biotopes, as well as the loss of an extensive and more environmentally sustainable animal production. This global trend can be exemplified by the development in Sweden. The traditional farming systems with nature pastures, before the agricultural revolution, built on keeping the animals on nature pastures over the growing season, and housed and fed by hay (harvested on permanent meadows) over the winter. The pastures were very extensive, covering large areas of forest and mountain areas (Myrdal 1999). Typically, the nature pastures were not fertilised by other than the droppings from grazing animals, and this grazing and moderate fertilising led to the rich flora and fauna that we value highly today (Ekstam & Forshed 2000). The agricultural revolution brought many changes to this system, and fertilised pastures on cultivated grasslands came to replace many of the nature pastures. This led to a great quality improvement of animal feed, and meant that food production could increase (Myrdal & Morell 2001). The increased food security became a cornerstone in building the modern society, but at the same time biodiversity of agro-ecosystems began to decrease, a development that continued during the 20th century as farms became more and more specialised and efficient (Isacson & Flygare 2003). In Europe this trend has led to a special focus on agricultural biodiversity in the Common Agricultural policy of the European Union, with both direct payments for environmental measures and on projects that can enable farms to produce both food/energy and ecosystem services (European commission 2017).

Combining farming with nature conservation is one of the main challenges that need to be overcome in order to preserve the HNV pastures. Jackson (2002) pinpointed the problem: “Farming is a rapacious business [...] In addition to financial stress, farmers face unpredictable weather, machinery breakdown and disease outbreaks. There is not much room, economic or otherwise, to do anything on the land that doesn’t pay for itself in cash relatively soon” (Jackson 2002, p.45) Some conservation biologists have a low esteem of the general farmer’s interest in biodiversity, and this leads to farmers and environmentalists often being viewed as opposing categories in their priorities for landscape management (New 2005). However, there is a rising interest for solutions and innovations that make it possible to combine nature conservation with profitable and sustainable agriculture (van der Windt et al. 2017, Hessle & Kumm 2011, HNV 2016, Bergeå 2007).

Aim and research questions

To investigate how agriculture and HNV pasture conservation can be combined in practice, a case study (Yin 2003) following a participatory approach (Greenwood & Levin 2007) was carried out in northern Dalsland, Sweden, in the spring of 2017. The study included interviews with farms, participatory observation and visioning workshops with stakeholders, followed by a sustainable livelihood analysis of the material (Ellis 2012). The study was part of the action-oriented Horizon 2000 project HNV-Link, which is about research on and extension of HNV-pasture based farms in Dalsland and in 10 other so-called “Learning areas” in the European Union (HNV-Link 2016 b). The project in Dalsland was run in collaboration with the County Administrative Board of Västra Götaland and the Swedish University of Agricultural Sciences. The aim of this investigation was to identify strategies and innovations used by farmers to gain a livelihood from HNV-pastures, at the same time as sustaining the ecological values of the pastures. The research questions were:

What are the most important factors for farmers when forming new strategies to gain a livelihood based on HNV pasture production?

What characterises activities and innovations that help farmers to sustain a living based on HNV pasture production?

Material and methods

Dalsland is one of the smallest provinces in Sweden, situated in the south-west part of the country between Lake Vänern and the Norwegian border. Even if it lies in the southern and more populated areas of the country, the province is still struggling with problems connected to urbanisation and reducing of the farming sector. This situation is most acute in the northern part of the province, where the landscape is dominated by forests and pasture-based production. The southern parts consist of flatland, and there the landscape is marked by specialised grain production, and the agricultural sector is stronger. The present study was conducted in the northern part of the province. The loss of HNV-pasture based farms in this area is problematic, not only because of the biodiversity loss, but also since it often means a loss of agriculture and livelihood, which influences the whole local society. The loss of HNV farmland has been severe. During the last 30 years, 1/3 of the HNV nature pastures have disappeared in the region (Hultegren 2016). In spite of this down-going trend, there is a number of successful farmers with nature pasture-based production in northern Dalsland, who manage to combine conservation with profitable farming.

The investigation consisted of 10 semi-structured interviews with farmers, and participatory observations at the farms. It also included participatory observations at six visioning workshops arranged by the County Administrative Board of Västra

Götaland in order to develop shared visions and innovations for nature pasture management as a part of the HNV-Link project. The participants at the workshops were actors from agriculture, distribution, governmental, NGOs and tourism enterprises. In total, the workshops had 50 unique participants. The material from the workshops has principally been used to validate the material from the interviews, especially matters concerning the local community. The first interviews were held with farmers who participated in the workshops, and contact details were gathered through them by way of the “snowball-method” (Bernard 1994). The farmers who were interviewed or participated in the workshops ran pasture-based production and had an interest in innovative and sustainable methods for how production and conservation could be combined on HNV pastures in northern Dalsland. The interviews were based on an interview guide (appendix 1), but were conducted in an informal and conversational way in order to gain an understanding of the farmers’ life-worlds (Kvale 2001). The interviews took approximately one hour, not counting the walk around the farm together with the farmer before or after the interview. The aim of the interviews was to gain understanding of the different parts of the farmers’ livelihood (including off-farm sources of income) and how they worked strategically with hindering and supporting forces in the business to reach the goals and visions of the farm. Focus was on the role that the nature pastures played in the business. The investigation was conducted using a participatory method, which means that part of the analysis was performed in cooperation with the informants (Greenwood & Levin 2007, Mendéz et al. 2015). In the workshops, the participants reflected on and visualised the situation for HNV pastures on local and regional levels, and in the interviews the informants were taken through a participatory evaluation of the farm system (Table 1).

Aim	Identifying farm assets and context (social and organisational).	Identifying and categorising goals and values of the farmers.	Identifying hindrances and opportunities as perceived by the farmer.	Identifying strategies used by the farmers to gain a livelihood.	Identify context and motivations for livelihood strategies.
Method	Semi-structured interviews and participatory observations at workshops.	Categorisation by farmer’s own descriptions in interviews.	Force-field analysis during interviews.	Farmer’s own description of strategies and categorisation through goals and value orientation.	Categorisation by sustainable livelihood analysis.

Table 1. Methods for collection and analysis of the material.

As a first step in the interviews, the farmers were asked about the assets and history of the farm, of their core values in farming and of their vision for the future. Then they were asked to identify the hindering and driving forces that they saw on their way to reach their goals with the farm, in an informal force-field analysis

(Burnes & Cooke 2013). As a final part they were asked of what strategies they used to overcome or utilize these forces (see appendix 1 for interview guide). The material from the interviews was documented by recording, with the informants' permission. Observations from the farm visits have been noted down in a field dairy. Observations at the workshops were also documented by note-taking. The farmers were anonymised, and citations from them have been translated into English. The interviews were transcribed; together with the rest of the material, they were divided thematically by means of the sustainable livelihood analysis, to form the basis for presenting the results (Table 2).

Livelihood platform	Access modified by:	In context of:	Resulting in:	Composed of:	With effects on:
Financial capital	Social relations (age, gender etc)	Trends (migration, technological change)	LIVELIHOOD STRATEGIES	Nature resource-activities (cultivation, livestock, non-farm)	Livelihood security (income level, income stability, degree of risk)
Natural capital	Institutions (rules and customs)	Shocks (Drought, floods, disease)		Non-nature resource based activities (Rural trade, services, manufacture)	Environmental sustainability (soil and land quality, water, forests, biodiversity)
Physical capital					
Human capital	Organisations (Agencies, NGOs, local admin)				

Table 2. Sustainable Livelihood Analysis (adapted from Ellis 2000).

The sustainable livelihood analysis (Ellis 2012) allows for both the economic and ecological realities that farmers face, and including social factors. The livelihood concept includes the work of the entire household, not only the farmer, it also includes off-farm income. Together with the farmers, eight examples of activities and innovations could be identified in this study as being important parts of the farmers' livelihood strategies for managing their HNV-pasture production. These examples consist of both major and minor solutions or innovations that helped the farmers form livelihood strategies to overcome hindrances, utilize opportunities and reach their visions for the farm. Livelihood strategies are defined as consisting of activities that generate the means of household survival. The strategies are dynamic; they respond to changing pressures and opportunities and they respond accordingly (Ellis 2012). Innovations often play an important role in the forming of new strategies. The new strategies can then either consist of bottom-up innovations founded by the farmer, or of innovations adopted by the farmers in a top-down manner (Leeuwis 2004).

All farms are different. To discuss farm differences in forming livelihood strategies for HNV pasture management, it is helpful to categorise certain traits (Leeuwis et al. 2004).

wis 2004). Stenseke (1997) used three categories in a study of farmers' perspectives on nature resource management. Economically oriented farmers had a very restricted interest in conservation, while ecologically oriented farmers had a very high interest – for some of them biodiversity was the main goal for their farm. Traditional farmers had a relatively high interest, since they often worked towards handing over their farms in a good condition to the next generation. This categorisation is, of course, a simplified version of reality; a farmer in the traditional category might very well have many traits from the other categories, and vice versa. Usually a farmer is somewhere in-between the categories, but with a predominance for one category. To clarify this, a model based on Stensekes categories has been used in the present analysis (Table 3).

Results

Livelihood platforms: The farm context

The farms in this study are different from each other, with different preconditions and livelihood platforms. Three farms have suckler cows for beef production, three have dairy cows, two had sheep, one has sheep combined with sucklers, and one has goats combined with intensive raising of bulls. I have used Stenseke's (1997) three categories for motivation and value orientation as a starting point for presenting the farms (Table 3).

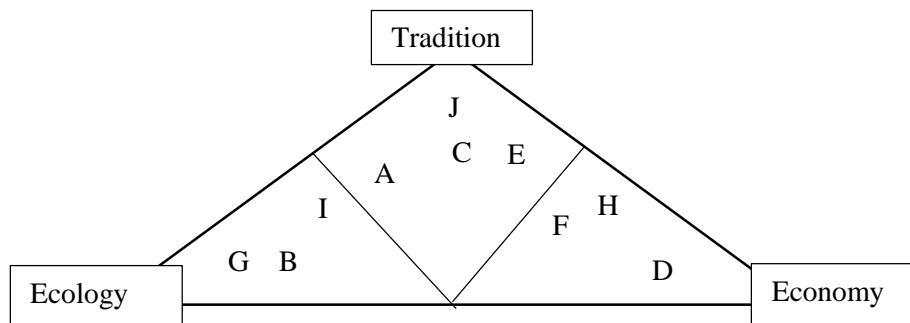


Table 3 Model of the interviewed farmers' (A-H) motivation and value orientation (adapted from Stenseke 1997).

During the interviews the farmers were asked to describe their values and motivations for their farming; based on their descriptions, the farms have been placed in the model and then categorised in the orientation to which they were closest.

The economically oriented farms are of larger size, between 220 to 450 hectares of land excepting forest. The farmers employ between three and six persons depending on specialisation, of which half were from outside the household. These farms specialised in a maximum of two lines of production. Several farms had invested in new buildings and machines, which meant that they have access to modern

equipment, but also that the mortgage level is higher. Even though optimizing subsidies is important for farmers of all orientations, the economic farmers paid extra attention to this, especially balancing the compensatory allowance and its requirements of animal density.

Today, it doesn't matter how good you are, or of course it matters how good you are in taking care of the land, but if you can't count... then it doesn't matter how good a farmer you are (Farmer D).

These farmers have goals and visions related to creating a viable and rational enterprise, employing local people and offering sound working conditions and hours for both employees and family members. One of the farmers described his vision as being a big farm and a backbone for the rural society, which smaller farms on part-time and hobby-level could build on. For the economically oriented farmers, the HNV pasture areas are small or in some parts almost non-existing, and the pastures were mostly on permanent pasture fields, or post-mowing grazing on cultivated fields. As a consequence, the interest for entering HNV pasture projects is low. However, nature pastures are appreciated, especially for grazing young animals. If nature pastures are used, it is important for the farmers that they do not entail any extra trouble or hindrances, but fit into the rational running of the farm.

The traditional farms are of different sizes, between 43 and 185 hectares, excepting forest. Typically, they are run as a family business. Several of the family members are working at these farms, often from different generations. All farms of this type have a relatively low investment level. Instead, old machines and buildings are used and reused. In one case an old building originally constructed for pig production had been rebuilt to become a stable for sucklers. The long continuity of the traditional farms often allows the farmers to plan investments ahead, and allow for changes that the next generation might want to make. In the case of the rebuilt pig house, the building had been planned so that it could either be rebuilt as a stable for sucklers or for robot milking. These multiple alternatives meant that the new generation has several different opportunities depending on interest and market factors. This investment strategy often means that the equipment is less modern on these farms, but also that the level of debt is lower. Subsidies for HNV pasture were sometimes less important for this type of orientation, and were in some cases spoken of with distrust – it is better to be free than tied up in obligations related to subsidies, was the reasoning in these cases.

That's the only thing we have dared to get tied up with: fences. We have applied for subsidies for that sometimes, and then they must be kept for 5 years. But it is not described how the pastures should be kept, it is only the fences we have taken on and tied ourselves up with. We are allowed to plough. If we had tied up the pastures, we would have been stuck if something happened (Farmers E).

The visions of these farms are often related to the next generation, making sure that the farm is well in order for the daughter, son or nephew who is going to take over. These long perspectives often mean that the farmers have an interest in taking good care of the environment and nature values of the farm, even if this is not the main goal. The traditionally oriented farms often have a remaining area of nature pastures that had been grazed for many generations. It could be small areas, a couple of hectares, or it could be bigger areas, up to 25% of the total farmland. In many cases, the farmer had done restorations of nature pastures, to regain land that used to be pastures. These restorations were sometimes motivated by ecological interest, and sometimes by a more general desire to take care of the landscape and the cultural heritage.

The ecologically oriented farms are usually run with other main objectives than economical. The goals and values are often related to nature preservation and life-quality.

You would probably do it in a totally different way if you wanted to earn a lot of money. But we have no other direct goal than preservation, and then you have to earn a little money to manage it (Farmers I).

Some of these farms are run part time, combined with other sources of income, such as agritourism and off-farm work. The farms are different in size, from 25 to 185 hectares, excepting forest. The HNV pastures amounts to different percentages of the farmland. In one case the entire farm consists of HNV farmland (winter fodder is bought from the neighbouring farm), while another farm only has 15 % HNV land. The interest in nature habitat conservation and restoration often leads to favourable possibilities of receiving subsidies for agri-environmental measures and restoration projects. However, the restorations are often made possible by voluntary and unpaid work by the farmer in addition to the subsidised restoration work. The farms are mostly run by one or two dedicated farmers, without employees. The lines of production are mostly centred around grass-fed meat production. Even if economy is not the main objective, these farms manage to obtain an extra income by increasing the value of their products by certifications and other means where both the environmental services provided by the pastures and the quality of grass-fed meat were used as sale arguments. Combined with subsidies for the pastures, this made it possible to invest in new buildings and equipment. Several of the farms with this orientation have contracts where they receive payment to graze nature reserves, which provides both an extra income and extra pastures for the animals. However, this also means extra work with transportation and daily checking of the animals (obligatory in Swedish animal welfare laws), since the reserves usually are located at a distance from the farm. One farmer described how he must drive 80 kilometres every day to check animals at the 5 different reserves he has contracted. The economic incentive is not the strongest motivation to do this:

I am so terribly interested in this thing with nature, so I gladly spend time on this! (Farmer B)

Factors modifying the access: the social and organisational context

The assets of the farms are affected by the people who farmed, and the social and institutional reality in which they farm. A number of factors relating to this context influenced how the farm assets are used: the social relations, the networks and institutions. This also influences how the farmers choose to manage their land, and how they get inspiration and input for making management changes.

The most highlighted social factor during the interviews and during the workshops relating to HNV pasture management was the local networks. This was something that farmers and other representatives from the local community perceived as important for how farmers in the area choose to manage their farms. The local networks, especially with the neighbouring farmers and landowners, could either be a source of inspiration or a hindrance for development. Especially in the most northern part of Dalsland, the farming community was described as negative and grudging towards new initiatives. This is a restricting factor, and is experienced as having a dampening effect on the entire local farming community.

And it is like, when one farmer leaves his land unused in fallow and just takes the Single Payment subsidies for it, then that rubs off on to other farmers. It's no longer viewed as bad, not to use the land. All in all, it is a pity. They say, poor you who keep it up; the mentality up here is that agriculture is shit. And then it is like viewed as almost a shame when someone is successful. But all in all, farming has got a negative sound to it, and that influences you (Farmer D).

This negative spirit also makes it difficult for the farmers in the area to get hold of good land for pastures. The fact that land-owners can earn enough from the Single Farm Payment by leaving the land to lie fallow make them less inclined to sell or lease it to active farmers. A farmer who wants to expand pasture-based production in these areas is then left either to pay higher tenures than the subsidies, or to graze the land but let the landowner take the subsidies – both alternatives to the loss of the farmer.

Then it is the thing with the subsidies, either that or wanting unreasonable tenures. Many of them have just bought a pasture topper, and then they take a turn with the tractor and that is it... (Farmer J)

The land of that farm is lying fallow, and it would have been so easy for me just to let my animals in there to graze, but they get plenty of subsidies and they haven't even had to top the pastures the latest years. If I go and offer them 500 SEK, or my maximum tenure at 1000 SEK, they are not going to take it (Farmer A).

This problem mostly concerns other pastures than HNV pastures, but gave a negative effect on HNV restorations and preservation. In the workshops, the participants reflected that HNV management is dependent on active farmers, and if the

local spirit among farmers and land-owners is so negative it will certainly be reflected on the HNV pastures. At the same time, just a few new and innovative farmers could create a hopeful feeling in the midst of all the negative. Several informants (both in interviews and workshops) tell of how the recently started local dairy "Dalspira" appears to create a ripple effect of hopefulness in the area around the village where it is based, not only among the contracted farms but among the whole local farming community. Just getting one new farming neighbour could inject energy. An elderly farmer in the northwest part of Dalsland describes his feelings about a neighbour who had newly started up farming:

There is one down the river who is going to start up, he has built for 100 cattle, and that kind of thing is really great (...) Awfully lively boy that, 26 years old. It is great! (Farmer J)

When the local networks were negative or non-existing, the farmers became more dependent on other social networks for inspiration and input. Having an off-farm part-time job was sometimes not principally a question of whether the farm could support the farmer full-time or not, but rather due to social networks. Several farmers in the interview-study expressed that the off-farm job was a way to get away from the farm and meet people. Due to the present down-going trend of farming in northern Dalsland, being a farmer is a lonely job.

Then all the neighbours quitted – when I started in 1990, we were 10-15 dairy farmers around here, and the last years we were only two. So I lay off dairy cows and took up sucklers, and started working at [local company] for the social bit (...) Yes, if it hadn't been for the social bit I would never work at [local company], there wouldn't be any problem to live on the farm (Farmer B).

In these cases, the social network provided by the off-farm work gave input and inspiration to the farm management, since the work often was connected to agriculture, forestry or construction work. Apart from this, combining farming with an off-farm work could be part of a livelihood strategy in itself. Other networks besides the local farming community could be organisations of various kinds: associations for farming, breeding and hunting, sports clubs and dairy cooperatives. There were also informal networks, consisting of friends from for example agricultural colleges, which were in the same line of business but elsewhere in Sweden or abroad.

The context for livelihoods: trends, hindrances and opportunities

The strategies adopted by the farmers to use HNV pastures were not only dependent on the social and organisational relations, but also on the surrounding context and trends. The trends either involved hindrances that demanded strategies to cope, or opportunities that needed strategies to take advantage of them.

Negative spirit among the local farming community
Lock-in effects of pastures by Single Farm Payment
Lack of local farming networks
Not being paid enough for HNV pasture management
The workload of HNV restorations
Complicated bureaucracy for HNV subsidies
Field division and transfer of animals
Fences, water and daily checks
Predators and other wildlife
Parasites

Table 4. Perceived hindrances for HNV pasture based farming in northern Dalsland listed in order of declining importance.

The trends that were emphasised as most relevant to HNV based farming in Dalsland, both in interviews and in workshops, were those related to urbanisation and environment. The urbanisation trend was regarded as the cause of the drainage of the local farming community. Another trend that was given much attention during workshops and interviews were the new interest for local food, and for environmentally friendly food. This trend was regarded as leading to new market channels and opportunities, even though it was also regarded with distrust and cautiousness against relying too much on it, especially from the traditionally oriented farmers. Climate change and biodiversity loss were other pressing trends that affected the farmers' strategies. The interest from the society for ecosystem services provided by HNV pastures were regarded as creating many opportunities through economical subsidies for upkeep and restoration of HNV pastures. The main hindering forces identified by the farmers in Force field analyses during the interviews are listed in Table 4.

Livelihood strategies: Activities and innovations

The farmers formed livelihood strategies based on the circumstances presented above: farm assets, social and organisational relations, and the surrounding context. The strategies are formed to help the farm gain livelihoods for the people working at the farm, based on the conditions of the specific farm and on the goals and values that the farmers wanted to fulfil. In turn, these strategies had effect on the HNV pasture management and the ecosystem services they provide. Innovations played an important part in forming new strategies, either adopted innovations from outside or innovations stemming from the farm itself. Eight of the most prominent types of activities and innovations at different levels relating to HNV pastures that emerged in the study will be presented as examples of what the farmers' livelihood strategies consisted of. The farmers' value orientation will be presented in connection with this, to form the basis of a discussion of the results.

Shared workload in the farm household

A common way for the traditionally oriented farms to cope with the farm work is sharing the workload in the household, something that often are an important part of the livelihood strategies. For many farmers the generation shift was an important step in their farming career, which also involved a shared workload. The ages of the farmers in the interview-study ranged from around 35 to past retirement at around 65. Some farmers are in the middle of a generation shift, some have recently shifted or were planning to do so soon. In most cases the shift meant a transfer of knowledge; the older generation continued working on the farm after a shift, or the younger generation helped at the farm if the shift was still far in the future. This meant additional workforce for the farms, an input of experience from the older generation, and new ideas from the younger generation.

Another aspect of the shared workload was related to gender roles, something that also was more apparent on the traditionally oriented farms. Even if the traditional farms are run by one male farmer, there are often several other family members involved, either an older or younger generation as discussed above, or a female partner. At three of the traditional farms the partner has an off-farm job, bringing an income to the household, that is independent from the farm income. The partner also helped out on the farm when an extra hand was needed, thus enabling certain flexibility to the farm, both in household economy and farm workload.

And then it has been like this for me that if I haven't done the milking, she has, and if she hasn't done the milking I have (Farmer J).

The work of the female partner was in these cases an important security, and made it possible to make changes, for example enlargements or restoration projects that required extra work efforts at the farm. Even though traits of the shared workload system could be found in all of the studied farms, it was only the traditional farms that used it as an important part of their livelihood strategies.

Community Supported Sheep

The concept of "Andelslamm" (Community Supported Sheep) is an innovation using CSA (Community Supported Agriculture). It is developed by an organic and ecologically oriented farm to market meat from sheep kept on restored HNV pasture. By buying a sheep in advance in spring, the customer gains an opportunity to actively support HNV restoration while the farmer attains an increased security and can plan the production and distribution better. The farmers launched the concept last year, and it has been well received by customers, especially from the nearby cities. The Community Supported Sheep are grazing 20 hectares of restored HNV pastures. The CSA approach means that the customers have more insight in the production, and can become more aware of the link between HNV pasture restoration and the consumption of meat from the grazing animals.

The advantage of this is that the consumers get locally produced meat, they get closer to the production, the sheep farmer gets more secure deliveries, and easier to plan deliveries, and gets an income earlier in the season, instead of not knowing how many animals you can sell (Farmers G).

This innovation was founded by the farmers as a solution to the problem of adding value the HNV pasture products; it also suits their livelihood strategy which centres around their passionate interest in ecology and restorations. They now hope to spread the innovation to other sheep farmers.

Gender-sorted insemination scheme

During the last two years, an economically oriented organic farm has used gender-sorted insemination on their stock. The farm keeps 150 dairy cows, and the gender-selection enables them to steer the recruiting. It is mainly used to inseminate male sperms from semi-heavy beef breeds. The bull calves are later castrated and kept as bullocks on pastures further away from the farm than the dairy cows. The bullocks can therefore graze HNV pastures while still ensuring profitability on the farmer. This innovation enables the relatively large dairy farm to combine milk production with pasture based beef production.

In the past it was the dairy production that was the motor for the farming community, producing not only milk but also calves as by-products. If you then can get something that works on pastures and that's not only bags of bone...There is much Holstein today, and Holstein bulls on pasture, I mean that goes without saying, no one has that. And if you instead can add something... we add Limousine a lot, because we want a bit of heavier breeds on the black-and-white...because it is like night and day! (Farmer F)

The recruitment rate of the dairy cows is low (25 %) since the farmer aims to keep the cows healthy for as many lactations as possible, and a majority of the cows are instead inseminated with male beef breed sperm. The result is that the farm keeps 100 bullocks on HNV pastures and other permanent pastures. The innovation builds on a new method, and the farm is among the first in Sweden to use it on a large scale. This specific farm has adapted it to suit their strategy, since they have access to a lot of pastures, being the only big farm in an area without any of the mentality leading to lock-in effects that characterises other parts of the province. Another reason why the innovation was chosen is that there is a veterinary in the family. The main incentive for including meat produced on pastures in the livelihood strategy is the stable market price on beef.

Corridors for animal transfer

To manage the many pens and small patches of pasture in a rational way, a traditionally oriented organic farmer has developed a system of corridors between pastures. The innovation is his own idea, developed from a need for animal transfer. His land consists of both HNV pastures, where he keeps sucklers, and fields where

he grows hay and oats for human consumption. To transfer cattle between the pastures, he has constructed corridors leading from the pastures closest to the farm to the outfields, past the cultivated fields.

I think that there are several benefits with it. It's both to get light and biodiversity close by the cultivated fields, and then it is a way to transfer the animals from the farm, often the cows, and then they walk like – it is like a traditional cattle path but with HNV pasture that they graze, so I can move the animals from here and 2 kilometres away like this (Farmer A).

This method both simplifies transfer of animals (enabling frequent moving of the animals) and creates strips of biodiverse HNV pasture around the fields, which is advantageous to the crop production and suits the farmers general livelihood strategies. The system is inspired from the historic use of cattle paths, but has been developed to suit the present needs of the farm.

Grazing-season adapted breeding schemes

To manage their pastures, two farmers have independently developed systems for steering insemination and mating to suit the grazing season. Their versions differ, both due to their different lines of production, different market situation and because of their different livelihood strategies.

An organic and ecologically oriented farmer has designed a system for mating of heifers to suit his production, which was beef production with sucklers on HNV pastures, with several contracts to graze nature reserves. Since his own land consists of a multitude of small pens of pasture, his animals are divided into many smaller groups. Transfer of bulls between these groups was problematic, and meant that he had to have several bulls every season, which is both expensive and risky. To avoid this problem, all the first-calvers were mated so that the first calving was in autumn instead of spring. The result is that the heifers have six months to grow before having their first calf, which in the farmer's experience makes healthier cows. This strategy is developed to suit the care of HNV pastures, and to solve the practical problems of the many pens that sometimes are needed.

A conventional and economically oriented farmer with sheep production has developed a system for utilizing the start of the growing season. The farmer has very little HNV pasture and mainly use pasture on cultivated fields, but during the grazing season the whole production is pasture based. The market for selling sheep is good during spring and early summer. The farmer has planned the lambing to February, having the final fattening at the same time as the growing season begins when the grass is extra nutritious. This strategy was motivated by the market opportunity, and the farmer's ambition to make use of the pasture resources.

Mobile abattoir contracts

One economically oriented farmer recently entered a contract with a mobile abattoir, which help him to sell pasture-based products in a rational and profitable way. The abattoir named "Hälsingestintan" is Europe's first mobile abattoir for fully grown cattle, and offers on-farm slaughtering. The process of starting up the abattoir was motivated by a wish to provide consumers with "ethical" meat, from animals who have suffered minimal stress during slaughter. The company has a strong interest in meat quality, and is therefore very interested in contracting farmers with pasture and grass-fed production. The abattoir keeps their own herds of cattle, and contracts farmers to raise the animals for slaughter.

It is convenient to have contracts like these, because you don't have to invest in animals. I had of course earned more if I had owned the animals myself, but this is a good solution, both parties make a profit from it. Now I get paid once a month, so I get more even payments (Farmer D).

The adoption of this market innovation becomes a key part in the farmer's livelihood strategy. This model makes it easier for the farmer to fulfil his goal of running an economically sound and rational enterprise, and to lower the risk and investment level of pasture based production.

Rotational grazing

To avoid problems with parasites, and to ensure good quality pastures, four of the farms in the interview study practised some sort of rotational grazing system. The intervals for rotation varied, and were in some cases as often as every week or every day. At one farm this practice was referred to as holistic grazing, connecting it to the system developed by Allan Savoy. The other farmers use the system based on observation of what worked best for them, and on traditional knowledge.

We mostly do it in our own way, we have many animals on a small area and don't let them stay long, like maximum a week, so not in too big pens then, they must be able to eat it clean in a week (Farmer A).

In practise it meant that the animals are kept in bigger pens divided into smaller sections by movable electric fences, or in a system of many small pens with permanent fences. Co-grazing with different types of animals is also a popular way to keep up the quality of the pastures, and to avoid parasites. This activity involves extra work for the farmers, but is regarded as an essential investment in the important resource which forms the basis for their livelihood strategy: pastures.

Agritourism

One common activity used to diversify the farms and spread risks is through agritourism. Five of the farms in the interview study are practising some sort of

agritourism, and three farms rented out cottages to tourists during the summer season. One of these, a traditionally oriented farm, also rented out flats in a house to long term tenants. Another of the farms, an ecologically oriented one, offered activities and courses connected with small-scale farming to tourists, and planned to expand that.

We are going to build cottages, tipi-tents and a meeting-hall where we can have courses and conferences...It is very small-scale, and what you sell is peace and quiet and nature...I think it is a life-style concept, it sounds trite, but that's what it is. It is food and nature and environment, a lot of things combined (Farmers G).

Another farmer plans to start up a cooperation with his neighbours and offer guided bus tours to the farms in the area to promote the local farm products. A common feature was that the farmers made use of the scenic landscape created by the HNV pastures. The open and “classically Swedish” rural landscape attracted tourists, especially international. One of the farmers had a contract with a booking agent, but the others took care of the advertising themselves.

Discussion

In discussions of new ideas and innovations on pasture, it is often the innovation itself that is in focus, or the social and regulatory context in society that makes the innovation possible (HNV-Link 2016 a, Leeuwis 2003, Lamprinopoulou et al. 2014). In this study, attention has been given to the immediate context and motivation for innovating or adapting at farm level, and the innovations have been regarded as parts of strategies formed to gain a livelihood. In studying the results of this investigation, it is apparent how the farmer's own goals and visions of the farm are determining factors to how new livelihood strategies are formed. The farmers in the study apply different types of strategies according to their value orientation (Table 5).

The economically oriented farmers have a stronger focus on utilizing the market opportunities, as for example can be seen in the breeding schemes presented in the results, both for sheep and for dairy cows. The economically oriented farmers in the study are actively on the lookout for opportunities and innovations to adopt at the farm, both from the market as in the mobile abattoir example, and from agricultural science, as in the gender sorted insemination scheme. An important point for farmers of this orientation is to find strategies that enable them to (as much as possible) have normal business hours, and to run the farm as a rational enterprise.

The traditionally oriented farmers have a focus on production and technical or management solutions. Quality, animal welfare, smart resource management and good farming practices are often at the heart of their strategies. The traditional farm structure of involving the whole family plays an important part in the livelihood strategies at these farms. The traditionally oriented farms are often experimenting to find better solutions at the farm, as in the example with the corridors for animal transfer, or adopting new ideas that were spread through farmers' networks.

The ecologically oriented farmers are working passionately with improving the ecological values of their farm, and their strategies were related to finding solutions that would provide payment for the ecological values that the production creates, not only for the products alone. A good example of how this could be done is the Community Supported Sheep scheme. Building relationships with customers

was an important factor for these farms. To reach their goals, the farmers are trying out new ideas of their own construction, or ideas from farmers' networks or other networks.

Activity /innovation	Characteristics	General livelihood strategy	Farmers orientation
Shared workload	Older and younger generations as well as partners share the workload. Knowledge transfer.	Taking care of the farm for future generations. Being a good farmer and manager.	Traditional
Community Supported Sheep	Building relations with customers and gain safer income through a market innovation. Work intensive.	Managing and restoring HNV pastures, building connection with customers that are willing to pay for ecological values.	Ecological
Gender sorted insemination scheme	Using a technological innovation to develop the beef production, due to the good market for beef.	Running a sound business, and making good use of the pasture-resources available.	Economical
Corridors for animal transfer	Moving animals between pastures and create strips of HNV pasture around the grain fields.	Finding good management solutions in a resource efficient way.	Traditional
Grazing season adapted breeding schemes I	Prolonging mating season by making the heifers calve in autumn. Adapted for many small patches of HNV pasture management.	Taking care of the HNV pastures and producing high quality meat.	Ecological
Grazing season adapted breeding schemes II	Planned lambing so as to utilize the start of the grazing season for fattening of the lambs. Strong market for lamb meat in spring is the incentive.	Following the market and making the most of the pasture resource.	Economical
Mobile abattoir contracts	Contracts to host cattle for an abattoir. No cost for animal capital.	Running a sound business, keeping mortgage level low.	Economical
Rotational grazing	Keeping up the pasture quality, both in terms of production and biodiversity, with a low parasite level.	Managing pasture based production.	All
Agritourism	Making use of the scenic landscape created by pasture by renting out cottages or other forms of agritourism.	Diversifying the pasture-based farms.	All

Table 5. Activities and innovations supporting livelihood strategies among the farmers in the study.

However, even though the farmers' own ambitions and goals were of weight, the strategies and innovations described in this study were also influenced by the biophysical and regulatory context of the farm; the farm assets and the regulations and subsidies. Apart from this, the social and organisational context was important, something that was emphasized during the visionary workshops. In northern Dalsland the local spirit among famers is low, especially in the very north. The common narrative in the local society as described in workshops and interviews

were “farming has no real future in Dalsland”. The farmers in the study manage to keep up their inspiration either through other networks (such as farming friends in and outside Dalsland, at off-farm jobs or other organisations) or by working actively to influence the local farming network.

In studying the complex reality that influences how farmers gain a living with HNV pastures, it is important to examine the method critically. The results were obtained with a participatory method, and this meant that part of the analysis was conducted during the interviews, and thus validated by the informants, which increases the reliability of the study. The categorisation of farmers by value orientation and an analysis of the hindering and motivating forces were both done in co-operation with the informants. Even if another set of categories had been used, the core fact would remain: that the values and goals of the farmer affects the direction of the farm. The qualitative method of in-depth interviews meant that only 10 farms were reached by the interviews, but the results (especially concerning the social networks and community spirit) were validated and complemented through the 6 workshops.

With an understanding from the case of farmers in Dalsland, how can innovative livelihood strategies based on HNV pastures be supported through extension and regulations? Extension concerning innovations has long been focused on top-down communication of innovations, but as the critique of this view has grown, bottom-up perspectives focused on communication have more and more gained popularity (Leeuwis & Aarts 2011, Turner et al. 2016). The implications of this case study in northern Dalsland are that different farmers have different strategies for gaining a livelihood on nature-pasture based production. Consequently, they also have different starting points in forming new strategies, and their fundamental values and goals regarding their farm is a key point. New strategies could consist either of adapted top-down innovations, or of innovations of the farmer’s own construction. If communication for promoting innovations in HNV pasture farming was only directed towards spreading top-down innovation, it would suit some farmers, but many would not be reached. The results of this study seem to point to that the economically oriented farmers are most inclined to adopt top-down innovations, being more prepared to take risks, while farmers of ecological and traditional orientation more often use innovations of their own invention. More studies would be needed to draw any distinct conclusions about this tendency and its implications. However, one conclusion that can be drawn from this study is that a transdisciplinary and holistic approach is needed when working with support and advisory services to promote innovative HNV pasture based farming. With this approach, the whole farm system can be taken into consideration, including the farmers’ own knowledge and values (Méndez et al. 2015).

The local networks and farming community play an important part in spreading new innovative strategies for HNV pasture based farming, but the local community spirit can also be discouraging and have a negative and hindering effect, as was described both in the visioning workshops and in the interviews. Building networks among local actors and promoting collaborative and social learning can be

ways to overcome the hindrances and to build stronger social sustainability, and at the same time promote innovations (Källström & Ljung 2005, Klerkx, Aarts & Leeuwis 2010). How extension and communication can work with the social community to support innovations in HNV pasture based farming is an area where further research would be needed, pursuing further into the question of how the society can promote the ecosystem-services provided by HNV farms, and how the farmers can combine preservation with production.

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Appendix 1, Interview guide

Starting with a tour around the farm together with the farmer.

Introduction: presentation of the project (if needed, some of the farmers have already attended the workshops) and of myself. Ask if the interview can be recorded. Inform about time for the interview – 1 – 1,5 hours – and about the anonymity. This information will also be given beforehand when booking the interview.

Background and present situation:

- How long have you had the farm? Is it a family farm or did you buy it?
 - What was your object and goals when taking over/starting up the farm?
Has it changed? Why are you a farmer today?
 - How would you like to see the farm in the future?
 - What kind of networks do you have? Is there a local farming network? In that case, could you tell me more about it?
-
- What are the different parts of the business? If you run the farm part-time, what else do you do for a living?
 - Pastures specifically: How much pastures do you have? How do you manage them? Do you have any potential HNV-land that could or are on its way to be restored?

Hindrances and opportunities

- Where do you see potential generally in the business? What are the challenges?
- How do you plan to work with nature pastures in the future? Potentials, hindrances?

Innovations and strategies

- How do you work to overcome these hindrances / capture the opportunities? What strategies do you have?
- How did you come up with the strategies you use?
- How do you get new ideas, inspiration and input in your farming?