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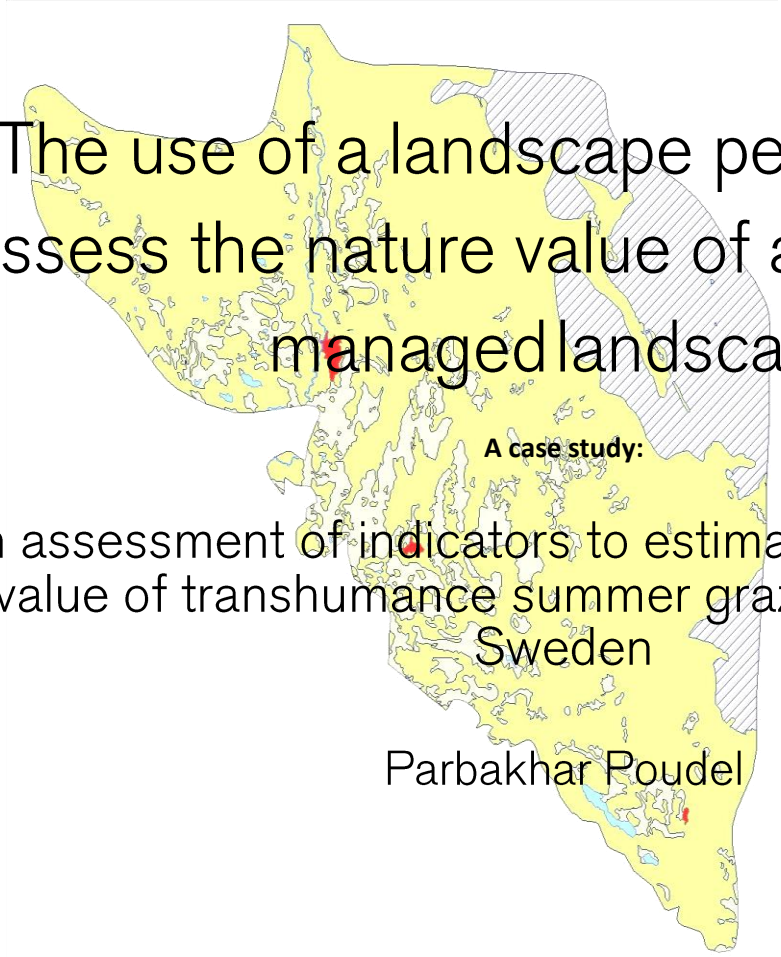

The use of a landscape perspective to assess the nature value of a traditionally managed landscape

A case study:

An assessment of indicators to estimate the high nature value of transhumance summer grazing practices in Sweden

Parbakhar Poudel

Uppsala 2010
EX0681 Master Thesis 30 hp
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Abstract

Loss of biodiversity related with diminishing traditional land use practice has raised global concern. Since, traditional land use practices is socio-economically unviable, many incentive based conservation approaches have emerged in order to encourage practitioners to continue with their practices. High nature value farmland is one of the newly emerged conservation approaches which aim at identifying causalities between farming type and biodiversity, and for providing support to the farming types which contribute to maintenance of biodiversity. Determination of the basis for the support is the major challenge, specifically the indicators used and the spatial extents taken into consideration.

In this study I have explored the possibility of using semi-natural grassland biotope as a potential indicator for assessing the high nature value of transhumance summer grazing practices in Sweden. Participatory Geographic Information System, questionnaire survey and key informant interviews were carried out to explore the existing management practices of Swedish transhumance summer grazing practices. Potential high nature value indicators included TUVA identified grassland and in addition seven others areas of conservation importance were analyzed for their proportional presence inside the summer grazed land. The results showed that transhumance summer grazing practices of Sweden is complex in terms of land coverage types and associated biological and cultural values. The area covered in TUVA identified semi-natural meadows and pastures are not sufficient to estimate the overall nature value of summer grazing landscape. Existing transhumance summer grazing practices are not limited to TUVA identified grassland biotopes and the importance of other associated landscape elements under the same grazing regime should not be underestimated. Each land coverage type has its own importance and cannot be separated from the overall value of the different land coverage types. Subsequently I argue that environmental incentives framed under the HNV concept should be able to address the complexity of rural land use dynamics instead of focussing on a limited type of land use practice.

Keyword: Traditional Land Use Practices, Biodiversity, High Nature Value, Summer Grazing, Sweden, Geographic Information System

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Abbreviation and acronym

AEM-Agri-Environmental Measures

CBD- Convention on Biological Diversity

CMFE-Common Monitoring and Evaluation Framework

COM-Communication from the Commission to the European Parliament

CSGRD-Community Strategic Guidelines for Rural Development Program

EASAC- European Academic Sciences Advisory Council

EEA- European Environment Agency

ESRI- Environmental Systems Research Institute

EU-European Union

GIS-Geographic Information System

HNV- High Nature Value

IEEP- Institute for European Environment Policy

MEA-Millennium Ecosystem Assessment

NAPTEK-Swedish National Program for Traditional Knowledge

OECD- Organization for Economic Co-operation and Development

PASTORAL- Potential Policy Approach to Support European Pastoralism

PGIS-Participatory Geographic Information System

PLA-Participatory Learning and Action

PRA-Participatory Rural Appraisal

SCF-Structural, Compositional and Functional

SLU- Swedish University of Agricultural Sciences

TEEB-The Economics of Ecosystem and Biodiversity

TLUP-Traditional Land Use Practices

TUVA-Swedish database containing biological and cultural values in meadows and pastures

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Chapter: One

Introduction

My study was undertaken as a joint effort between the Swedish National Program for Traditional Knowledge, (NAPTEK) at the Swedish Biodiversity Centre, The Masters program in Natural Resource Management at the Division of Rural Development, Department of Urban and Rural Development, SLU and the GIS-laboratory at the Department of Archaeology and Ancient history, Uppsala University.

1.1 Introduction

The promotion of traditional land use practices (TLUP) is a newly emerged conservation approach for biodiversity conservation in farmland. The approach is based on the fact that there is an inherent positive relationship between traditional small scale farming and biodiversity (Baldock *et al.* 1995).

After the Second World War many traditionally managed small scale farms were abandoned in Europe, in favour of larger scale farms based on improved technology and intensified farming techniques (Ihse, 1995). Two trends can be noted; in the agricultural areas of the fertile low land areas, the small scale farms were in general aggregated and modified to larger scale commercial farms. Farms situated in less fertile areas such as the mountainous region were to a large extent abandoned (Ihse, 1995; IEEP, 2007; McDonald *et al.* 2000). Socio-economic unfeasibility of the traditional farming practices (PASTORAL, 2003e, 2003h) and trends in post-war agricultural policy can hence be considered as the major causes for diminishing TLUP.

Researchers have noted that the changes of the agricultural land use systems have resulted in decrease of biodiversity. The biodiversity loss has been related with declining TLUP (Kristensen, 2003). The growing concern in biodiversity loss has led to the introduction of a number different agri-environmental schemes aiming at protecting biodiversity (Kleijn & Sutherland,2003). Regardless of different models used or implementation frameworks, these agri-environmental schemes can be said to share the same objective, namely to conserve the declining TLUP and prevent rural depopulation (Ibid).

In this context, High Nature Value Farmland (HNV) is a newly evolved conservation strategy initiated by the European Union. HNV aims to identify the relationship between certain farming

techniques and biodiversity, and in addition the scheme aims at providing support to farmers contributing to biodiversity (Paracchini *et al.* 2008). The concept is based on the major characteristics (indicator) of certain farmland categories. The aim is to assess the extent of different farming techniques contribution to maintain biodiversity. A semi-natural feature is considered as a major HNV indicator in the HNV farmland concept (Ibid). The concept of HNV and the associated indicators will be discussed in the next section.

Transhumance summer grazing practices in Sweden is a typical example of a TLUP with high biological values (Cousin & Lindborg, 2008; Dalhström *et al.*2006; Stenseke, 2006) and cultural values (Fortina *et al.*, 2000; Rikard *et al.* 2005; Sjolander-Lindquist, 2009). However this farming technique is currently diminishing at an alarming rate (Byström, 2009; Dalström, 2008; Edman & Wennberg 2008; Holstein, 2010; Larsson, 2009). The HNV farmland concept is at present not implemented in Swedish agricultural policy, but it might be in the future, since Sweden is a member of the EU (Sjödahl, 2008). Still however, it is possible to note that works which can be related with HNV have been implemented recently. One example is the TUVA database. Since semi-natural features of the agricultural landscape is considered as a major HNV indicator (Paracchini, *et al.* 2008), data of 'semi-natural meadows and pastures' (hereafter grassland biotope) have been collected through a "nationwide inventory" carried out in 2002-2004. The data is publicly accessible and available in electronically format. Authors (e.g. Sjödahl, 2008) have suggested that the TUVA database can be considered as a good foundation for assessing HNV of Swedish summer pastures.

Current trends points to the importance of assessing the concept of HNV. The purpose of this study is to examine if the TUVA grassland biotopes can be used as the sole indicator for assessing the HNV of transhumance summer grazing landscapes. [1].

Questions to be asked are; is the grassland biotope relevant as a HNV indicator? Is it possible to identify additional landscape elements with high HNV values? What are the spatial relationships between different biotopes of a summer grazing landscape?

The study will be carried out through an exploratory study of existing management regimes of transhumance summer grazing practices.

[1] I use the term *summer grazing landscape* to represent a grazing land as eco-mapped by a pastoralist.

1.2 Background

To begin with I will provide a research background by which I will discuss biodiversity, the links between what we can consider traditional land-use practices and biodiversity; and threats to traditional land use and biodiversity. In this part I will use the ecosystem service approach to describe the importance of biodiversity to human well-being. After that I will introduce the new interdisciplinary conservation approach, partly discussed above, i.e. the 'High Nature Value farmland' approach, which may encompass incentive based conservation of traditional land use in the future. I will argue that environmental incentives framed under the HNV concept should be able to address the complexity of rural land use dynamics instead of focussing on a limited type of land use practice. The issue will be addressed, in the second part of the chapter by setting out a case assessing High Nature Value characteristics of Swedish summer grazing practices.

1.2.1 Biodiversity

The concept of biodiversity refers to the variety of life and of habitats of the Earth, and biodiversity is vital to human welfare in many ways. Biodiversity provides goods and services that humans need for maintaining food-security and health. Biodiversity has a relation to ecosystem services. Ecosystem services are the benefits that people obtain from the ecosystem such as food, freshwater, timber, and climate regulation, protection from natural hazards, erosion control, pharmaceutical ingredients and recreation. Biodiversity is not itself an ecosystem service but it underpins the supply of services. Delivery of ecosystem services depends in many cases on the maintenance of biodiversity, for example for nutrient cycling, production under low-input management and pollination (EASAC, 2009). Biodiversity contributes directly by provisioning, regulating, and cultural ecosystem services and; indirectly through supporting ecosystem services to many constituents of human well-being (MEA, 2009). Provisioning ecosystem services include food production, energy, material for buildings and clothing, and plant for medicines. Regulating services include mitigation and absorbance of hazardous substances from environments. Cultural ecosystem services recognize that people, communities and societies place value on nature for e.g. aesthetic, spiritual, cultural or recreational values. In addition to these direct ecosystem services, biodiversity contributes to ecosystem services such as primary production, water and nutrient cycling, soil formation and retention (MEA, 2005).

The discussion above infers the extremely complex, dynamic and varied aspects of biodiversity. It is apparent that human beings and societies are integral parts of the ecosystem through dynamic interaction between a series of components of the ecosystem crossing many different spatial and temporal scales. By reducing biodiversity, ecosystem services risk to deteriorate; this in turn may affect humans and other species negatively. Loss of biodiversity can cause significant economic, environmental and social consequences. For example; changes in a watershed area may not only lead to potential loss of habitats or the ecosystem, but can also result in increasing economic costs for water extraction and/or filtration in the cities that are dependent on the water source. Deterioration of ecosystem affects its capacity to provide services, for example, the loss of specific plant or animal species might in turn affect tourist flows that are associated with them. Here, I would argue that certain areas in Thailand would see a considerable decrease in their tourism industry if the tiger habitats would be degraded. It is also possible to give additional examples, i.e. in the Kruger region of South Africa; many local communities are linked to animals such as wild buffalo and lion as a result of the ongoing tourism activities. To conclude, biodiversity is an important public good which contributes in many ways to society.

Threats to biodiversity

Human society has the capacity both to destroy and protect the biodiversity. Biodiversity has also been dramatically affected by man's activities. Human capacity and eagerness to extract natural resources and modify the ecosystem is exponentially increasing and has greatly been altering the composition, structure and function of ecosystems (Vitousek *et al.*. 1997), often overwhelming the ecosystems capacity to provide services critical for our survival (Kremen, 2005).

The main pressure on biodiversity results from habitat changes or loss due to land use changes, for example; unsustainable use and over-exploitation of natural resources, introduction of alien invasive species, climate change and pollutions (CBD, 2009). These threats are often interconnected and reinforce each other and cause serious cumulative effect (Hilty *et al.* 2006 p.11). Land cover changes degrade biodiversity in many ways for example it can be noted that commercial forestry have replaced diversified floras with monotypic tree species. During the last centuries agricultural land use has been intensified mainly in areas with high potential to increased production through industrialization of agriculture; farm specialization; and mechanization (MacDonald *et al.* 2000,

IEEP, 2007). In agricultural landscapes this trend has significantly reduced the farmland biodiversity by the loss of the semi natural habitat features of the landscape mosaic.

Other areas have seen abandonment during the last century. Abandoned areas are mostly from less favoured areas which have natural limitations in terms of difficult climatic conditions, steep slopes in mountain areas, or low soil productivity (Beaufoy, 2009). Abandonment may result in monotypic vegetation patterns or invasion of aggressive species, alien to the ecosystem, which may also significantly reduce the biodiversity. Traditional transhumance pastoral system and small scale farming in Europe are typical examples of land use where biodiversity has decreased after abandonment.

A policy instrument is another important factor which influences the human activities and leads to land cover change. A good example is the abandonment of low intensive farming practices in Europe due to the subsidy system of the Common Agricultural Policy (CAP) (Proposal, 2009). In the payment system, CAP was focussing to encourage technological development of European agriculture in order to enhance the production. Hence, most of the CAP budget went to a small number of large resource intensive farms, which still were engaged in unsustainable practices (ibid). The CAP policy results in changes of small scale low intense farming practices either to intensification or abandonment (PASTORAL, 2003e). The traditionally managed land has low output characteristics; CAP support to mechanized large scale farming has increased the market competition for traditionally produced agricultural products since they have to compete with commercial products of mechanized farms. This has forced many traditional land use practitioners either to intensify their production system to be competitive on the market or to give up the existing practice.

The discussion above indicates that land cover changes have a significant impact on biodiversity. Land cover changes through human mediated land use changes i.e. expansion, intensification and abandonment is predominantly driven by socio-economic as well as policy factors.

1.2.2 Traditional land use practices

Land-use denotes how humans are using the biophysical or ecological properties of land. Land-uses include agriculture, settlements, forestry, etc. but also those practices that exclude humans from land, as in the designation of nature reserves for nature conservation (Elis & Pontius, 2009).

Traditional land use includes practices and techniques, which have been out of fashion for many years and are not generally part of modern agriculture (Bignal *et al.* 1995). A characterizing feature of traditional land use is the low input and production per unit area, features which have resulted in that traditional land use are considered as low-intensity land-use systems. Typical examples of traditional low intensity land use systems in Europe includes livestock raising in upland and mountain areas; in the Mediterranean regions, and livestock raising on wooded pastures of the temperate lowland regions (for details see Baldock *et al.* 1995). Landscapes formed after a long history of traditional land use are considered to reflect a harmonious integration of abiotic, biotic and cultural elements (Antrop, 1997).

1.2.3 Linkage between traditional land use and biodiversity

Traditional land use practices contribute to high biodiversity. The high biodiversity in traditionally managed land is an unintended consequence of the low intensive land use. Traditional land use systems aim primarily to meet individual and situation-dependent needs instead of maximizing economic benefit such as in the high-intensive mono-agricultural systems. For this reason, external inputs, such as fodder and agrochemicals are usually low in traditional land use systems.

The low inputs together with the low intensity of traditional land use favours the dynamics of natural processes and this in turn enhances the structural diversity of vegetation (Baldock *et al.* 1995). Individual need and choice on crop lead traditional farmers to introduce a variety of crops, which increase the number of life forms in farmland. To grow those varied crops, farmers maintain a variety of different land use structures and processes. In addition, natural processes are relatively slow and results in relatively stable landscapes. Hence, researchers/policymakers interested in biodiversity maintenance consider traditional land use as an ideal land management system since it can sustain a range of economic, social and environmental services in a relatively balanced form.

Land use change is the major threat to traditional land use practices and the associated functions, for example its contribution to biodiversity maintenance. As discussed above (1.2.2), changes in traditional land use results either in intensification or abandonment, both processes having negative effects on biodiversity. Driving forces of land use changes mostly include factors such as local culture (food preferences); economies (product demand, economic viability, incentives etc); environmental conditions (terrain, soil quality, and climate), land policies and development

programs. The low social-economic viability is considered as the main reason for diminishing the pastoral systems of Europe (PASTORAL, 2003e).

1.2.4 Biodiversity conservation in farmland

As emphasized by "International year of Biodiversity 2010" in its official slogan '*Biodiversity is life, Biodiversity is our life!* conservation of biodiversity is a global concern today. Conservationists have realized that the goal of biodiversity conservation cannot only be met by protecting particular habitat or species by reserving certain areas for their protection (Beaufoy, 2006). This is partly because a significant number of the targeted flora and fauna are located outside the protected areas. For instance, it is estimated that 50% of all species in Europe live in agricultural habitats (Kristensen, 2003).

Here I will discuss how abandonment of traditional land use practices is a complex issue seen in relation to biodiversity conservation. On one hand, traditional land use practices is currently under severe pressure of abandonment due to the socio-economic un-viability, whereas on the other hand continuation of traditional land use is crucial for maintaining biodiversity.

The life style of traditional land use practitioners is characterized by low income, hard work, isolated life, low social status which currently makes it socially and financially un-viable.

As described earlier, the traditional land use system is based on low input and low return. There is no maximization in return and continuity is only for subsistence. Agricultural production (which has market value in current market system) is in general low and economically uncompetitive. In this regard the economic status of the TLUP practitioner is much weaker than for the commercial farmer. A few TLUP practitioners try to meet this by maximizing their profit through diversification of activities in their TLUP. Examples of this are how some of the farmers are maximizing their benefit through selling high quality local cheese and through engaging in tourism activities.

Although being socio-economically unviable TLUP are ecologically sound. The low input and the slow pace of the TLUP production cycle favours the maintenance of biodiversity. By this, TLUP maintains their natural value by addressing the aspirations of both farmers and rural communities, and increases the degree to which the value placed on these sites translates itself into direct reward

for ecologically sound entrepreneurship. Conservationists therefore are giving effort for continuation of this moderate level of human intervention to conserve farmland biodiversity.

A moderate level of human intervention is considered ideal for biodiversity maintenance in many areas. Human mediated disturbance involves anthropogenic primary and secondary succession that result in net increase of alpha and beta diversity. Alpha and beta diversity measures the biodiversity in spatial scale and are expressed in species richness. Alpha diversity refers the diversity in particular area of the ecosystem, where as beta diversity measures the difference in diversity between ecosystems. For example controlled fires are considered to have enhanced local diversity in open grassland (alpha diversity) (Balee, 2006). The Mediterranean basin is considered a biodiversity "hot spot" in parts because of its human-induced agricultural biodiversity (OECD, 2005). The inability to meet the target of halting biodiversity loss by 2010 (Bucheart, 2010) was also due to biodiversity loss from agricultural fields. The loss of biodiversity in agricultural fields is linked to land use changes i.e. intensification or abandonment, which changes are driven by market forces, policy choices and technological developments (PASTORAL, 2003 e; Proposal, 2009).

Naturally, nobody is motivated to get involved in a socially unacceptable and financially unviable profession. It is often difficult to attract new practitioners as well. The viable option to keep alive the TLUP could be encouragement of existing practitioner by creating better economic opportunities for them and securing their social sustainability. Incentive based conservation approaches can be an alternative which provides the economic support to practitioners for their effort of carrying out ecologically sound farming practices.

A number of approaches have emerged in order to evoke subsidies to farmers for maintaining environmental services. Below, I will discuss an approach that is based on the High Nature Value (HNV) farmland concept. The purpose of the discussion is to assess if HNV can be considered an appropriate tool for tackling the complex issue of biodiversity conservation in low intense traditionally managed land use.

1.2.5 High Nature Value Farmland Concept

High Nature Value (HNV) Farming is a fairly new approach for protecting biodiversity. The concept was initiated by the European Union in order to conserve farmland biodiversity through supporting low intensity farming practices in the member countries (Paracchini *et al.* 2008).

HNV is currently a central focus of European Union rural development policy. In the Kyiv Resolution on Biodiversity, 2003, The European Environmental Ministers agreed to identify HNV farmland in Europe. The European Commission has highlighted the importance of CAP to prevent abandonment and intensification of HNV (EEA, 2009). HNV is one of the agri-environmental measures (AEM) that farmers can get support from under the frame work of Community Strategic Guidelines for Rural Development Programme (CSGRD) period 2007-2013 (Paracchini *et al.* 2008). CSGRD has also emphasized HNV farmland and traditional agricultural landscape as one of the priority areas of rural development. HNV is one out of seven impact indicators of the Common Monitoring and Evaluation Framework (CMFE) which assess the economic, social and environmental impacts of the 2007-2013 rural development programmes.

Compensation for activities in designated environments is objectified to promote eco friendly ways of land use, which may sustain a range of social, economic and environmental benefits. Selected compensation for environmental benefits are paid to promote actions that favour natural, cultural, and recreational values in the countries. Activities which are getting support from the government for their environmental benefit include pastures and hay management, promotion of local breeds, and conservation of historical and cultural remains. All these aspects are directly linked to the transhumance summer grazing practices of Sweden.

Provision of economic compensation to land managers who deliver public goods is a good strategy to conserve biological and cultural values in landscapes outside legally protected conservation areas like, national parks, natural reserves and Natura 2000 areas. Natura 2000 is an EU wide network of nature protection areas and a central piece of nature and biodiversity policy. The main aim of Natura 2000 is to assure the long term survival of Europe's most valuable and threatened species and habitat.

Definition and types

High Nature Value (HNV) areas are farmland regarded as constituted on an intimate relation between farming practices and biodiversity and where continuation of those farming practices is essential for the maintenance of biodiversity (Beaufoy *et al.* 1994; Bignal *et al.* 1994; Bignal & McCracken, 1996; 2000).

HNV recognizes that there is a relationship between certain types of farming activities and nature values, such as high biodiversity; and promotes land uses systems which favour dynamics of natural processes and create opportunities for biodiversity. HNV farmland is defined as "areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity or the presence of species of European conservation concern or both" (Andersen *et al.* 2004). Typical high nature value (HNV) farmland areas comprise extensively grazed upland, alpine meadows and pasture (Paracchini *et al.* 2008). Based on natural features of system, three types HNV farmland have been proposed:

1. Farmland with a high proportion of semi-natural vegetation;
2. Farmland dominated by low intensity agriculture or a mosaic of semi natural agricultural features, and
3. Farmland supporting rare species or a high proportion of the European or world populations (for details see Anderson, 2004).

Indicators

To assess the HNV of an agricultural system[2], a combination of its structural, compositional and functional (SCF) characteristics is accounted for. To identify the appropriate indicators for characterizing the HNV types, information related to land cover, farming practices and species is required (EU, 2009).

All HNV indicators can be categorized into three broader criteria; namely the intensity of land use, presence of semi –natural features and presence of land use mosaic (Andersen *et al.* 2003). Mosaic in turn refers to variability of the structural components of the landscape, for example fallow land, stones, water body, old trees, grassland etc. The status of HNV indicators criteria in a system is identified through measuring the number of SCF characteristics, for example land use intensity is measured by using livestock density and nitrogen or biocide input per unit area of the farm. In the same way, semi natural vegetation or semi natural features of the agricultural system can be measured by identifying management practices and structural components of the system. Examples of the latter are unimproved grazing land, traditional hay meadows, mature trees, shrubs and/or uncultivated patches (IEEP, 2007).

[2] The term "agricultural system" is used to include the production types i.e. crops, livestock, fish, and forest products.

Structural characteristics of HNV include landscape elements such as forests, cultivated land, open meadow, pastures, grassland, and construction so on. Compositional characteristic includes biotic component of landscape for instance floral and faunal information at species level. Functional characteristics are related to ecological, social and economical role of system components in the whole system e.g. ecosystem services.

Every criterion described above provides information that can be used for estimating the HNV. However for providing a synthesis it can be said that the high heterogeneity in the SCF characteristics can be taken as an indication of a higher HNV value.

HNV characteristics of a farm can be spatially and temporally contextualised based on the local/regional/continental conservation priorities of specific habitat type and species (Paraccini *et al.* 2008). Authorities can imply contextual indicators (as sub-type) acknowledging local demand; such as conservation need of habitat and species.

1.3 Research approach

Landscapes are the spatial manifestation of the relationship between humans and their environment (Crumley & Marquardt, 1990), where people project their culture onto the nature by interacting with the physical environment. The structural and functional composition of a landscape is shaped through millennia of human activities, the history of land use and management, and its associated effects (Lawrence 2008).

Human activities are driven by cultural, economic, social and environmental forces, and this applies also to the shaping of a landscape. Land use changes and the effects of these on the structural composition of the biophysical environment mirrors how humans shape landscapes and interact with the environment. Through the landscape perspective, culture is seen as embedded in the environment, a relationship, which not only preserve the existing landscape but is also designing new ones. Removal of cultural practices from the existing system transforms the whole system; it results in the loss of structural elements, and changes the function of the system. The incorporation of the human dimension of ecosystems is of utmost importance as ecological management is increasingly influenced by the ways in which different stakeholders' value and influence biodiversity.

In my study, I will use a landscape perspective for examining the interaction between farmers and the surrounding landscape. The existing management practices of transhumance summer grazing practices of Sweden will be my main point of reference. The landscape approach will enable me to find an appropriate spatial scale[3] for studying and identifying crucial anthropogenic interventions in the shaping of biodiversity.

1.4 Research problem

From the discussion above it is apparent that state intervention has an important role for increasing the provision to farmers that delivers biodiversity. In order to accomplish an effective support system it is also important to implement an efficient policy. Since TLUP is both the medium and the outcome of practices in interaction with local settings, it can be suspected that local level data play a crucial role for the design and implementation of an effective support system. So far few studies have focused on the local structural, functional and compositional characteristics of summer grazing farms in Sweden.

In addition, the High Nature Value farmland concept is rarely used in Sweden. The late entry of Sweden into the EU and overlapping purposes of the HNV concept and the national environmental objectives[4] might be the main reasons for this (Sjödahl, 2008). Even if the HNV concept is new in Sweden it can be considered as old in practice. Many agricultural activities in present Sweden are carried out in line with the HNV concept under the national environmental objective "Varied Agricultural Landscapes". Under this objective, there is a provision to farmers who contribute to maintaining or restoring various pastures and meadows [5] . In relation with this, the semi-natural meadows and pastures in Sweden has recently been surveyed by the TUVA project "nationwide inventory semi-natural meadows and pastures" (2002-2004). TUVA is considered to give good foundation data and is for this reason recommended to be used for designing effective HNV indicators (ibid). For this reason it can be suspected that the TUVA database will be an important tool in the future for assessing the HNV of summer grazing farms. This provokes the question; can the presence of semi-natural meadows or pastureland be used as sole indicators for assessing the

[3] The term scale I used is from the ecologist point of view on which larger scale means bigger area.

4 For detail see http://www.miljomal.se/Environmental-Objectives-Portal/

5 1) restoration of pastures and hay meadow , 2) grazing and mowing at remote locations 3) managing a mosaic pastures grasses or other poor soils, 4) Burning of pastures grasses or other poor soils 5) Hay handling , 6) Specific management of pasture grazing and 7) Fenced against predators , 8) holdings of local breeds. For detail see www.sjv.se

HNV of summer grazing landscapes? What is the role and importance of different land coverage types? For example in summer grazing practices, if one pastoralist is grazing grassland pasture, what is the importance of other element in vicinity, for instance forest pasture? How can they influence the existing management regime? What is the effect of the nearest conservation area on their grazing pattern and cattle behaviour and vice versa.

An environmental consequence of land abandonment is explored assessing the biodiversity value in landscape level. The basic human -nature relationship according to ecosystem approach identifies the role of human being in ecosystem, how it is influencing the overall ecosystem services[6]. If humans are considered as being an active biotic component of the ecosystem, it is vital to understand how humans have perceived the landscape and the related practice and their contribution to the shaping of the overall function of the ecosystem. Since the coverage of traditional land use patterns in the mountainous area of Sweden is large, the landscape is the best scale to study agricultural land use changes. How human activities have been shaping landscape is important in less favoured area (LFA)[7]. Human landscapes is strongly influenced by social, economic, political forces and it has been proven that how ecosystem services underpins human well-beings (c.f MEA, 2005).

In order to address the question I will develop an approach that uses HNV and a local landscape perspective on a series of summer farms in Sweden.

1.5 Research objectives

Subsequently the questions for this study are; can the presence of semi-natural meadows or pastureland be used as sole indicators for assessing the HNV of summer grazing landscapes? What spatial scales should be considered in assessing the HNV characteristics of summer grazing farms? The second question is important for avoiding heterarchy or with other words the structural condition in which some landscape elements have the potential of being unranked relative to other elements in the landscape.

[6] Ecosystem services: those goods and services from ecosystems that benefit, sustain and support human livelihoods (MA, 2005)

[7] Classified under Article 19 of EC Regulation 1257/1999 as "in danger of abandonment of land-use and where the conservation of the countryside is necessary", in LFA area **agricultural production or activity is more difficult because of natural handicaps**, e.g. difficult climatic conditions, steep slopes in mountain areas, or low soil productivity in other less favored areas

My objective is to understand human practice and the shaping of landscapes for being able to analyse which landscape elements that may possibly be overlooked if the grassland biotope is taken as the single HNV indicator. The study is to a large extent based on a comparison between the TUVA data (which I will consider as the official view) and real ground data based on the mapped landscapes of Swedish summer farms, as a basis for identifying HNV. The comparison will provide an inter-site perspective on grazing land which may help in suggesting the spatial extents that should be considered as suitable in assessing HNV indicators of summer grazing practices. In order to do this I will undertake following objectives:

-To identify the spatial extent of existing summer grazing practices.
- To identify the status of grassland biotope inside summer grazing landscape.
- To identify the status of selected area of conservation importance other than grassland biotope

Chapter: Two

Study Area and Methods

In this chapter I will begin with introducing and describing the Swedish summer grazing practices. In the later part of the chapter, I will describe the physical setting of my study area and finally the methods used.

2.1 Swedish Summer Grazing Practices

2.1.1 Background

The movement of livestock to pastures situated in higher elevation, hilly forest or mountainous, areas in the beginning of summer (May/June) and to lower altitudes at the onset of winter (October/November) are a characteristic trait of transhumance pastoralism (Fortina *et al.* 2000). This type of free ranging and herded livestock grazing in summer farms has also been common in Sweden. A summer farm is called *fäbod* in Swedish and is defined as a 'periodic summer settlement for the purpose of using pastures held in common for grazing and processing milk into non-perishable products. Summer farms have buildings for the accommodation of humans and livestock and for the processing of milk. The summer farm was a specialized feminine workplace and a specialised function within the farm' (Larsson, 2009). This definition infers that the summer farm is for stock breeding, but not for grain production. Traditionally, the summer grazing practices was based on the movement of the livestock to outlying pasture during the summer months. The strategy was crucial for allowing the grazing resources nearby the main farm to be harvested as winter fodder. Present summer grazing provides added value as a pleasant landscape with rich biological content, locally produced food and exclusive accommodation, or profits generated by the low supply of external inputs to the system (Christin, 2006).

The rise and fall of the summer farm system in Sweden was driven by social and economic reasons following changes in the society and in the agricultural system after the late medieval crisis in the 16th century (for details see Larsson, 2009). According to Larsson the establishment of summer farms in the 16th and 17th centuries was due to shortage of agricultural labour. The shortage was an effect of wars where more than 30% of the adult men died. Animal husbandry provided a good opportunity for women to develop their farming practices.

The numbers of summer farms increased when the government introduced compulsory rules for farmers to hold summer farms in the 17th century. Farmers were forbidden to keep their animals at the village during the summer time.

The late 17th centuries is considered the golden period for the growth of summer farms (Larsson, 2008). Most of the summer farms in Sweden were abandoned during the last 200 years. The trend of leaving the summer farm practices started in 1870s and by 1920 more than 50 % of summer farms were abandoned (Larsson, 2009). The market also influenced the type and size of the livestock holdings. The increasing and decreasing pattern of goat and sheep holding was market driven, i.e. demand for products, hide, milk and cheese (ibid). The shortage of the labour, modernization of agriculture and dairy industry; whatever were the reason of abandonment of transhumance summer grazing practices in Sweden, all were related to economic factors and financial viability of operation.

Despite the cultural and ecological contribution, summer grazing is one of the most threatened traditional land use patterns in the world. Summer grazing practices in the Swedish mountains is declining dramatically (Edman & Wennberg 2008; Dahlström, 2008, Larsson, 2009, Holstein, 2010).

2.1.2 The landscapes of the summer farms

Summer grazing practices are seasonal activities which last for only 3-4 months. Despite the fact that the summer farm system have a short duration, it has great importance for the shaping of biological, economical and cultural values of Swedish rural life. This seasonal farm activity is providing a moderate level of anthropogenic disturbance which is necessary to maintain the bio-cultural value of summer grazing area. Moderate level of human intervention is considered beneficial to maintain species richness in grazing land (Billeter, *et al.* 2008; Steffan- Dewenter *et al.* 2002). Studies show that grazing is considered to be the best and sustainable management approach to maintain biodiversity and productivity of grassland (Carmel & Kadmon, 1999; Lake *et al.*, 2001).The abandonment of summer farm in Sweden is affecting the biodiversity value of grazing landscape (Edman & Wenberg, 2008).

Summer grazing practices seems simple because of its short grazing period but it is complex in term of structural and functional component of the landscape system. The structural component

represents the land coverage type, e.g. forest, grassland, lake, river shores, bogs, mire and so on. These different types of land coverage types might have different grazing values. The different grazing values (forage type, availability, and distance from summer house) determine the movement of animals and consequently the area of influence in the landscape. Summer grazing is free herding in nature (Fortina *et al.* 2000) so the exact boundary of the grazing is not limited. In addition, the grazing intensity may vary based on forage quality; animals tend to visit areas where they get their preferred forage more frequently. The functional component represents the social, economic and environmental role of different structural component on summer grazing system.

2.1.3 Rationale behind selecting Swedish Farm

I chose the Swedish summer grazing practice to explore the HNV mainly for the following reasons: HNV indicators are highly contextual (spatial and temporal) in nature; I thought Swedish summer grazing practices would be fruitful to study using HNV concept because Swedish summer pastures provide a spatial and temporal context which agrees well with the HNV concept. Also, the HNV concept is yet to be implemented in Sweden, which means a study of selection criteria might be meaningful for its implementation. Secondly, transhumance summer farming practices in Sweden is one of the most threatened TLUP, and dominantly located in less favoured area where chance of agricultural intensification is low.

2.2 Study Area

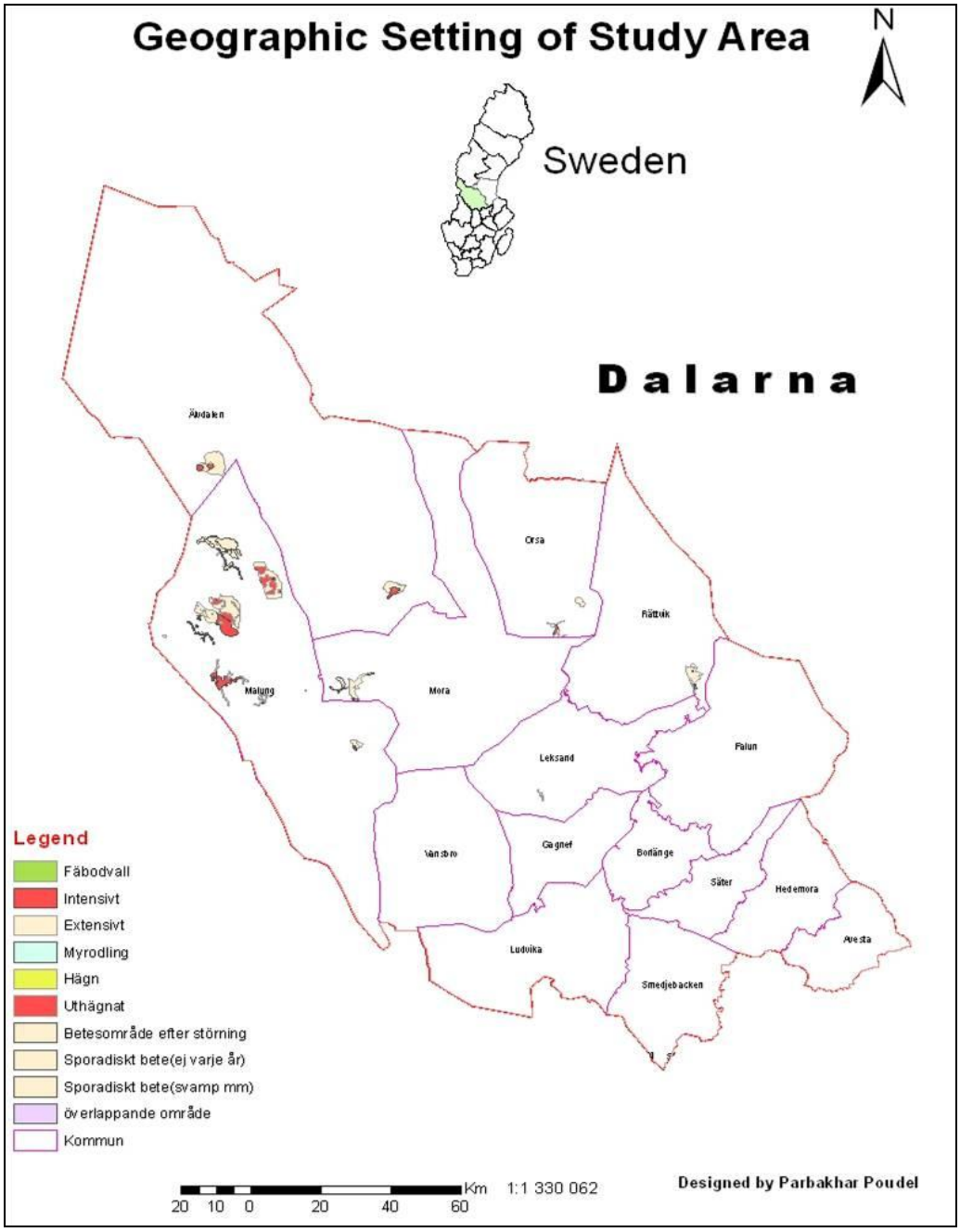

Figure 1: Geographic setting of study area

My approach was tested in a study area located in Dalarna, in the middle part of Sweden. Twenty active summer grazing areas were studied to get an understanding of the existing management regime during the period of 2008-2009. These summer grazing areas are distributed in five communes namely; Mora, Älvdalen, Malung ,Leksand and Rättvik (Figure 1). More than 50 % of

the studied summer farms are located in Malung. Dalarna can be considered a Sweden in miniature representing all types of vegetation and nature found in Sweden (Sigrand *et al.* 2009). More than 70 % of the county land area is wooded and 9 % is protected conservation areas. As mentioned before, summer grazing practices was considered an important agricultural aspect during the 17th Century (Larsson, 2009), but now the practice is being gradually abandoned, raising questions of its existence in the future. Diversity in vegetation patterns and the high number of summer farms (abandoned and active) motivated me to work in that particular area.

2.3 Methods and Material

Methods applied in the study was broadly targeted to extract two types of information; one was the exploration of existing disturbance regime of the summer grazing and the second was to locate the status of potential HNV indicator i.e. TUVA projected grassland biotopes and seven other selected factors in the grazed landscapes.

Geo-spatial tools were applied together with participatory methods in the research. Geographic Information System (GIS) was used as an overall method in the project; ranging from the stage of data collection to the final analysis. This allowed me to cover the issues at a landscape level, which would be almost impossible in the field survey. The linking of the ethnographic method with the geo-spatial tool was efficient in terms of time and expenditure. Eco-mapping is a Participatory Geographic Information System (PGIS) and together with a questionnaire survey and interviews these were my tools for obtaining primary information from the local informants. Available literature (printed and electronic form) and GIS data from authorized sources were secondary sources of information.

2.3.1 Exploration of Existing Management regime

Eco-mapping, questionnaire survey and key informant interview were used to collect information about the spatial extents and existing management regimes of the summer grazing.

Eco-mapping: The information collected by eco- mapping is used as baseline information for this study. The data was obtained by the Swedish National Program for Traditional Knowledge, NAPTEK in 2008, where I was involved in the data processing. Eco-mapping is conducted by using participatory geographic information system (PGIS) in which pastoralists portrayed the information

of their summer grazing areas on transparencies projected onto the topographic map in scale 1:50000.

Figure 2: Sample of eco-mapping

PGIS is a map based interview and group discussion technique by which informants will be able to provide information by drawing the map themselves with the help of an expert. Participatory geographic information system (PGIS) has its roots in Participatory Learning and Action (PLA) and Participatory Rural Appraisal (PRA) (Rambaldi *et al.* 2007). The gain of using this approach is that it combines participatory mapping visualizations, spatial information technologies (SIT), spatial

learning, communication and advocacy (ibid). Goebel (1996) suggests that the conjunction of PRA with other methods will triangulate the findings from social and technical research. This in turn helps to overcome data being gapped or being limited through the influence of dominant informant in the group discussion (ibid). Geo-information tools have successfully been used in a number of projects to solve this type of problem (Mapedza *et al.* 2003). This can be done either using transparency on the topographic map or by digitizing on a portable computer with a topographic map as a backdrop. This interactive mapping has a number of benefits, viz. attribute data can be entered on spot, and output could be assessed during the digitizing process (Bemigisha, 2008). Several studies (Close & Hall, 2006; Scholtz *et al.* 2004) found PGIS to be an important complement to conventional mapping by the addition of a local perspective. The contribution of local knowledge on research bears great importance on research related to resource management, especially if data from empirical research is limited or not available (Store & Kangas, 2001).

In the eco mapping conducted by NAPTEK, the pastoralists marked the number of landscape elements and information related to land use practices on map, for example; grazing intensity, hay making areas, fences, details of animal, predator prone areas, water source areas, abnormal animal behavior, cow trails, settlements, biodiversity rich areas, historical sites, and so on. This firsthand information from the pastoralists was digitized by using Esri's software Arc Info 9.3. After head up digitizing, maps were printed and sent to the pastoralists for comments and corrections. After incorporating the corrections that were obtained from the pastoralists the digital data were prepared for further analysis. The pastoralists were also asked for their permission to publish the data.

Questionnaire survey: A semi-structured questionnaire with eleven questions was sent to pastoralists. This was written in English and translated into Swedish. Before sending the questionnaire to respondents it was tested, in order to avoid unnecessary and unclear questions, in ranges of experts. The questions covered management practices and pastoralists knowledge about their landscape. The questions were targeted to ask about management practices, more particularly focusing on the land use intensity (e.g. live stock units), practice related to environmental services (e.g. hay making) and maintenance of semi-nature features (e.g. orientation of farm house; animal captivations; and manure management). Some questions were targeted to issues related with the diversification of farm activities. The questionnaire was also designed in such way that it would gather pastoralist perceptions about the major reasons for current trends of diminishing summer grazing practices.

Key informant interview: The information which was not clear from the information obtained during the questionnaire survey was sought from by a key informant interview. Three informants, who were actively engaged in conservation issues of summer farms, were interviewed. All three key informants who were interviewed also participated in the questionnaire survey.

2.3.2 Finding the status of potential HNV indicators inside the summer grazing landscape

Grassland biotope and selected area of conservation importance was assessed by using GIS tools. Data from "National survey of semi-natural meadows and pastures 2002-2004" (TUVA) was used to locate the semi-natural grassland inside the grazing landscape. GIS data from Swedish Forest Agency were used to locate area of conservation importance inside the summer grazing landscapes.

Semi-natural pastures and meadows: A "nationwide inventory semi-natural meadows and pastures (TUVA)" in Sweden was carried in 2002-2004. The inventory recorded of Swedish agricultural land used for semi-natural grazing that contains substantial environmental and cultural value. In TUVA, 301,348 hectares of land was inventoried, of which 270,126 hectares were classified as valuable land. The valuable land comprises five categories; semi-natural meadows, pastures, possible meadows, forest or mountain grazing and, areas restorable from a cultural and natural value point of view (Swedish Board of Agriculture, 2005b). The size of the inventoried land ranges from minimum 0.1 hectare to larger than 100 hectares.

The survey data describes environmental qualities related to semi-natural pastures and meadows, for examples its flora, fauna, cultural values and habitat. The report claims that the data collected in survey are useful to follow up and evaluate the Swedish Agro-environmental and Rural Development program and also the Swedish environmental objectives, "A varied Agricultural Landscape" (ibid)

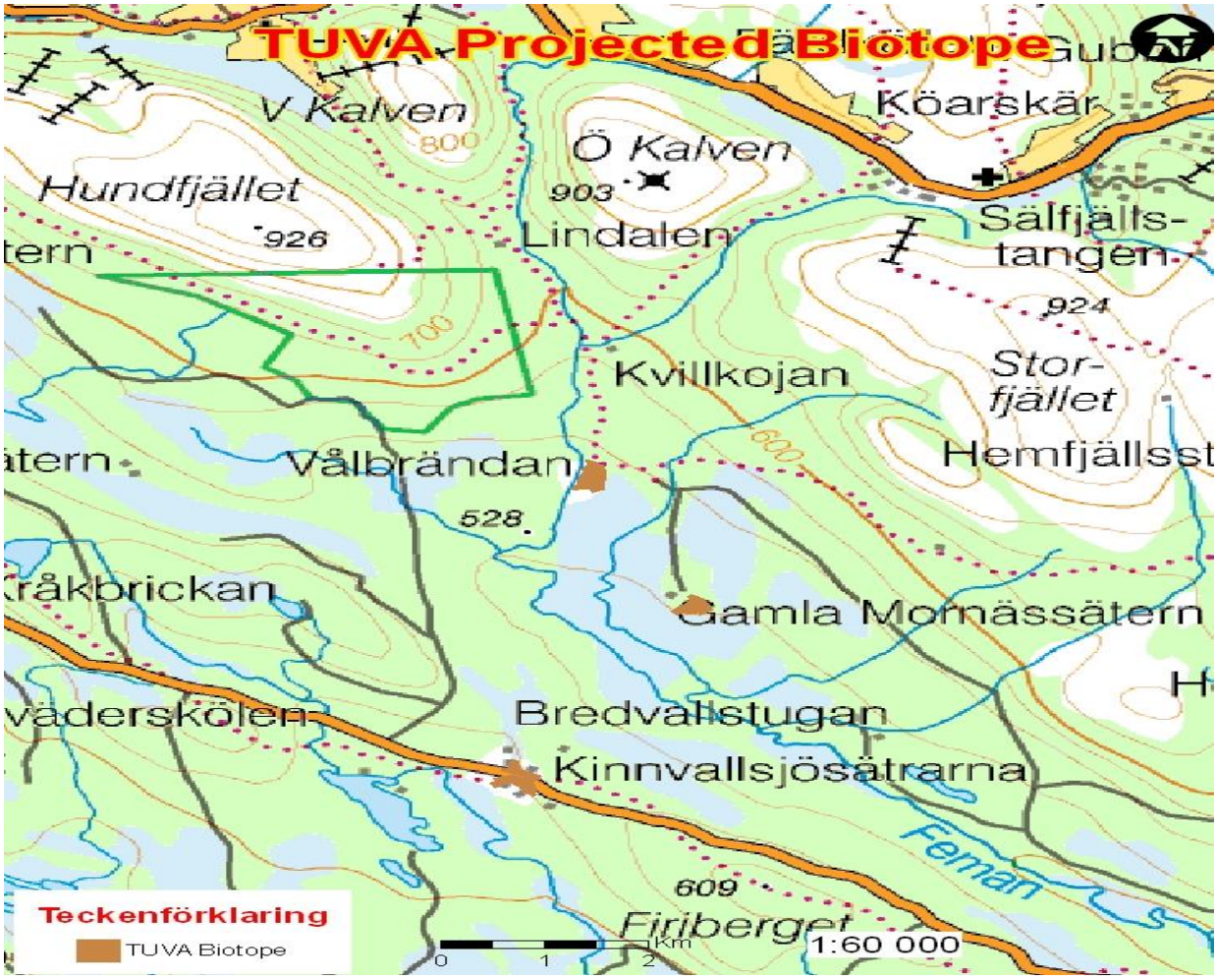

Figure 3: Spatial distribution of TUVA grassland biotope in one summer grazing area

Area of conservation importance:

The Swedish Forest Agency has collection of information about valuable habitats in Swedish forest. These valuable habitat types contain site of biological, cultural and historical importance and are updated regularly. For example, key biotopes are forests with high conservation values. These forests have characteristics that give them key roles as refuge for threatened and endangered animals and plants. In the same way, habitat protection areas are areas designed for protecting the habitat of important plants and animals in fragmented and scattered habitats (Swedish Forest Agency, 2010).

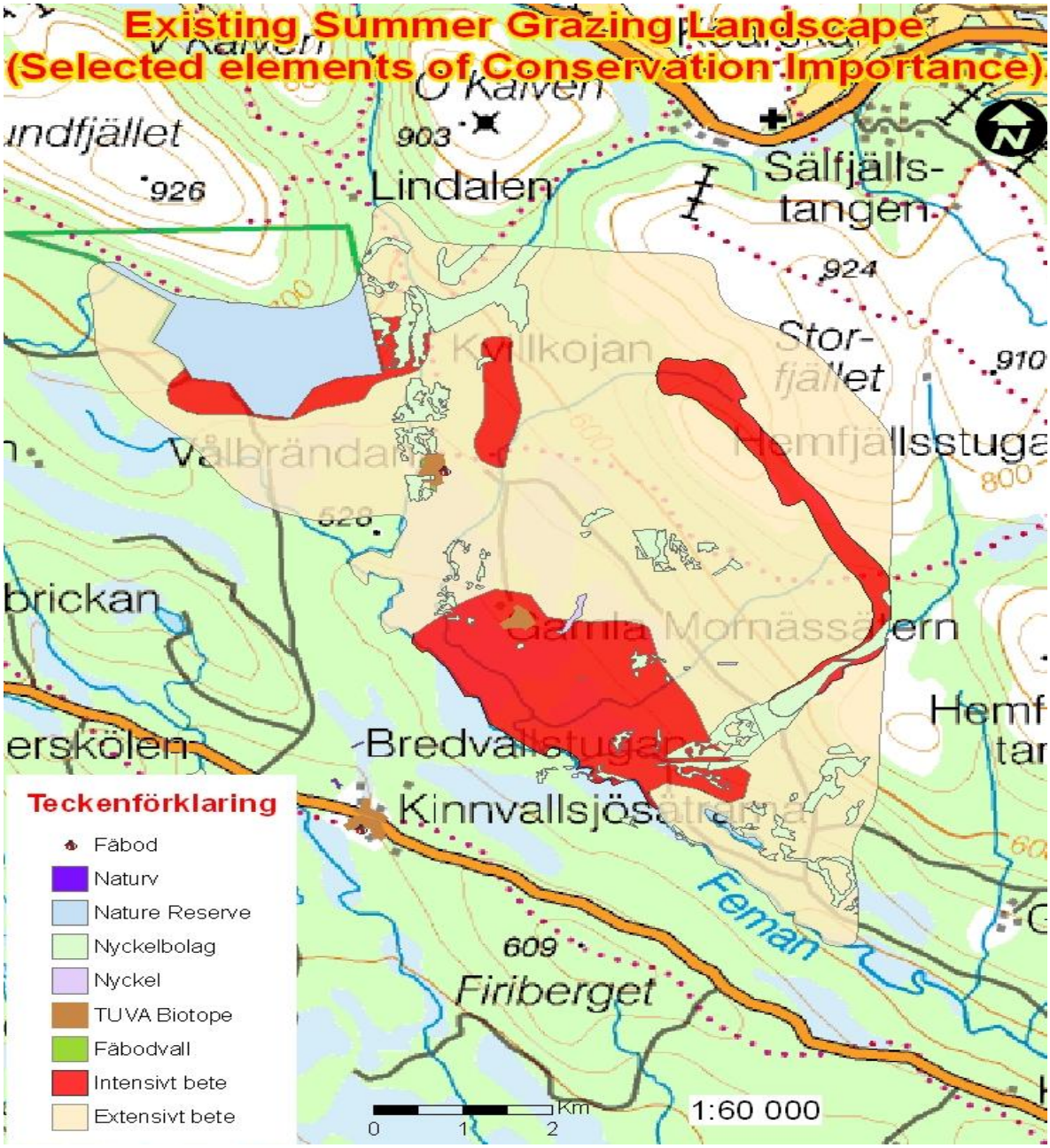

Figure 4: Spatial distribution pattern of selected area of conservation importance

Information of seven different valuable habitat types listed in Swedish Forest Agency is used in the analysis. These include; habitat protection area, key habitat, key habitat co-operation, valuable natural area, nature protection agreement, nature reserve and, archaeological and cultural remains.

Chapter: Three

Results

This chapter contain three parts dealing with the three specific objectives of the research. In the first part of the chapter, I will present the important characteristics of existing management regime of summer grazing landscapes based on data collected from eco-mapping and questionnaire survey. In the second part I will present the status of TUVA projected grassland biotope inside the summer grazing landscape. The final part of the chapter is devoted to a discussion of the distribution of some selected areas of conservation importance. One summer grazing landscape will serve as an example of the spatial arrangement of landscape components.

3.1 Existing Summer Grazing Practices

3.1.1 Grazing area

Size and land cover type of the summer grazing areas varies greatly. The size ranges from 13 to 5249 hectares with a mean value 1405.3 hectares. The grazing land has been categorized into extensively and intensively grazed areas based on grazing intensity (Table 1).

Table 1: List of summer grazing landscape with grazing nature

SN	Grazing Landscape	Commune	Area (Ha)		
			Extensively grazed	Intensively grazed	Total
1	Arvsälen	Malung	554	88	642
2	Kinnvallsjösätrarna	Malung	1619	2149	3768
3	Kruppa	Orsa	501	-	501
4	Kråkbrickan	Malung	773	-	773
5	Ljusbodarna	Leksand	110	-	110
6	Matsäl	Mora	1667	39	1706
7	Västra Moran	Malung	3117	2132	5249
8	Mosätern	Malung	239	43	282
9	Norra Kallberget	Malung	-	506	506
10	Prästbodarna	Rättvik	1612	-	1612
11	Sjöändan	Malung	13	-	13

12	Svartåsen	Malung	84	-	84
13	Särksjöätern	Älvdalen	3 330	262	3592
14	Södra Grunuberg	Orsa	221	221	442
15	Tisjölandet	Malung	692	1617	2309
16	Urväderskölen	Malung	34	79	113
17	Vidkölssätern	Älvdalen	471	242	713
18	Vålbrändan	Malung	3704	1205	4909
19	Västra Grunuberg	Orsa	203	-	203
20	Arvsälen	Malung	1363	242	1605

Farmers had marked their grazing land under different categories including extensively grazed, intensively grazed, and others like: hay making area, fenced area, grazing area during predator disturbances etc. The grazing area during predator disturbance is not included in the area calculation, whereas fenced areas and hay making areas are included in the category intensively grazed. The categorization of grazing land was based on the eco-mapping carried out by the pastoralists' and their own assessments. It should be noted that the pastoralists have portrayed a lot of other interesting information in their eco-mapping which can be linked to cultural and biological value of summer grazing landscape. For example, some areas are marked as habitats of stationary bear. According to the informants the bear did not harm or threaten their livestock. This can mean that the bear is herbivorous or a selective predator targeting wild animals. In addition, some areas are marked as predator feeding areas- i.e. areas which the livestock do not favour-, additional areas noted were areas with unusual behaviour of the livestock, mushroom collection area, fodder rich area and so on. All this information infers the farmers' knowledge about their grazing land, which in turn should be considered related to the structural elements of a grazing landscape.

3.1.2 Livestock

The livestock holding (animal type and stock size) of farmers seems uniform in all summer farms. Cow, goats, sheep and horses are common animals. Livestock density; i.e. the livestock unit per hectare has not crossed 0.28 for any farm. Livestock unit (LU) was calculated following the guidelines, which are used to apply for, 'environmental support for pastures and hay meadow' from the Swedish Board of agriculture (2010). These guidelines defines 1 livestock unit (LU)= 1 cow older that two years or 1.67 cow aged 6 months to two years or 6.67 sheep / goats or 1 horse unit.

3.1.3 Environmental support

Information on the environmental support which farmers were getting for the management of summer grazing landscape was also sought through the questionnaire. The majority of farmers responded that they are getting the environmental support in the title of *fäbod* management. But respondent did not talk about support type, i.e. in which heading they are getting support for, e.g. whether the support was for hay production, or holding the animal of local breed, or fencing for predators etc., a few examples of the headings designated for environmental support to fulfil the Swedish Environment Objective 'Varied Agricultural Landscape'. A lengthy administrative procedure was given as a main barrier to access the environmental support.

3.1.4 Major reasons of diminishing transhumance summer grazing practices

Farmers were asked to give three main reasons for abandonment of summer grazing practices. The responses were categorized in to four main groups under the heading of: poor working condition, economic un-viability, policy issues, and predator problem. For example, if the responses were 'government does not care about the free grazing', this was categorized under the heading of 'policy issues' of abandonment. Similarly, if the respondent answer was, 'it is no more profitable', then the responses were categorized under the heading of 'economic un-viability' in categorization, so on and so forth.

The result indicate that the harsh and hard working condition of summer grazing practices is one the major threats of abandonment of summer grazing practices. All respondent put this reason as a major cause of abandonment. Economic un-viability and predators were ranked second and third reason of abandonment scoring the percentage of response of 83 % and 75 % of respondent respectively (Figure 5). 42 % of respondent also think policy issues as a reason of diminishing trend of summer grazing practices in Sweden.

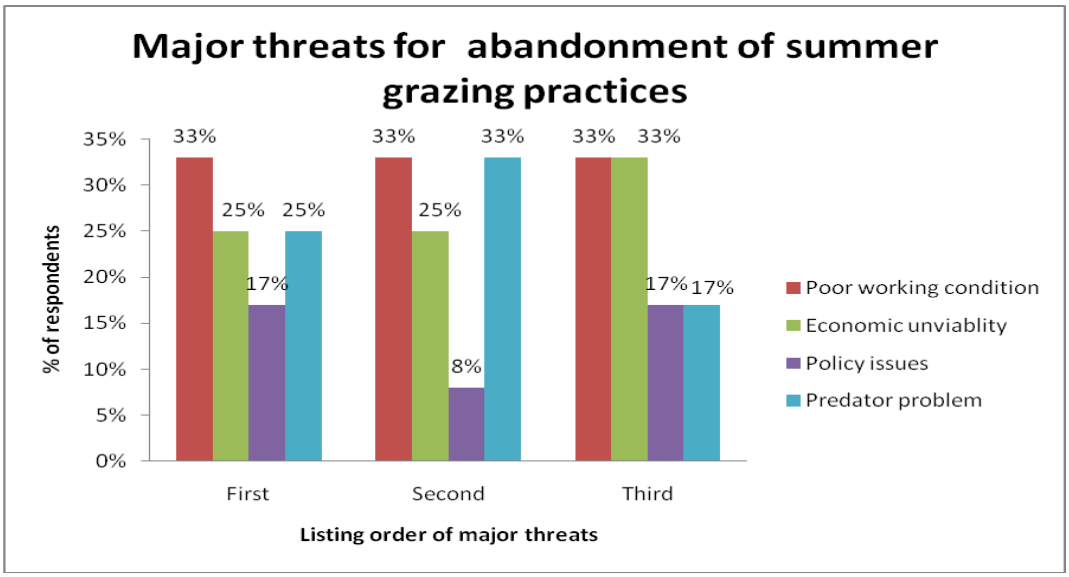

Figure 5: Major threats of fäbod abandonment

3.2 Semi-natural meadows and pastures

Out of analysed twenty summer grazing landscapes, 15 summer grazing landscapes contain the grassland biotopes inventoried by TUVA. Size, number and location of grassland biotope located inside summer grazing landscape vary considerably.

The size of the semi-natures meadows and pastures present inside the summer grazing landscape ranges from 3. 21 - 40. 98 hectares, with an average value of 14.30. Nine summer grazing landscapes contain more than two isolated semi-natural meadows and pastures. 13 farm houses are located inside grassland biotope.

Table 2: List of Semi-natural meadows and pastures inside the grazing landscape

SN	Grazing landscape	TUVA biotope		% of grazing landscape	Summer House
		Count	Area (Ha)		
1	Arvsälen	2	40.7	6.34	1
2	Kinnvallsjösätrarna	1	11.44	0.30	1
3	Kruppa	1	7.19	1.44	1
4	Kråkbrickan	0	0.00	0.00	0
5	Ljusbodarna	4	3.21	2.92	1
6	Matsäl	5	47.67	2.79	2

7	Västra Moran	0	0.00	0.00	0
8	Mosätern	3	17.98	6.38	1
9	Norra Kallberget	1	13.41	2.65	1
10	Prästbodarna	1	31.20	1.94	1
11	Sjöändan	2	7.1	54.62	1
12	Svartåsen	0	0.00	0.00	0
13	Särksjöätern	1	6.84	0.19	0
14	Södra Grunuberg	0	0.00	0.00	0
15	Tisjölandet	3	25.74	1.11	0
16	Urväderskölen	0	0.00	0.00	0
17	Vidkölssätern	0	0.00	0.00	0
18	Vålbrändan	2	17.78	0.36	1
19	Västra Grunuberg	2	40.98	20.19	2
20	Öjskogsfjällets fäbod	1	16.07	1.00	1
	Total	**29**	**287.31**		**14**

3.3 Status of area of conservation importance

Areas with conservation values which were analysed inside the grazing landscape were habitat protection area, key habitat, key habitat co-operation, valuable natural area, nature protection agreement, nature reserve, and archaeological and cultural remains. Except archaeological and cultural remains, all others areas of conservation importance were in polygon features, hence their area proportion in summer grazing landscape was calculated.

Table 3: List of habitat of conservation importance

SN	Fäbod	Total Area (Ha)	Area of conservation importance (Ha)						7 (count)	Total area (Ha)	% of grazing landscape
			1	2	3	4	5	6			
1	Arvsälen	642.00							5		
2	Kinnvallsjösätrarna	3768.00		1.9	13.95	1.03				16.88	0.44
3	Kruppa	501.00		1.3		15				16.3	3.25
4	Kråkbrickan	773.00									
5	Ljusbodarna	110.00		8.1					2	8.1	7.36
6	Matsäl	1706.00	11.40	30.7		4.19			6	46.29	2.71
7	Västra Moran	5249.00		15.3	15.9	6.74			48	37.94	0.72
8	Mosätern	282.00		0.1			0.08			0.18	0.06
9	Norra Kallberget	506.00		12.2		1.4	3.55			17.15	3.38

10	Prästbodarna	1612.00			3.32	6.61			2	9.93	0.61
11	Sjöändan	13.00									
12	Svartåsen	84.00									
13	Särksjöätern	3592.00	3.00	12.56	11.98					27.54	0.76
14	Södra Grunuberg	442.00		2.64		3.25			2	5.89	1.33
15	Tisjölandet	2309.00		14.34		17.48	10.1		1	41.89	1.81
16	Urväderskölen	113.00									
17	Vidkölssätern	713.00		7.4		181.94		108		297.34	41.70
18	Vålbrändan	4909.00		5	333.87	0.06		297	1	635.93	12.95
19	Västra Grunuberg	203.00							3		
20	Öjskogsfjällets fäbod	1363		13.59	455.71					469.3	29.23
	Total	**29132.00**	**14.40**	**125.13**	**834.73**	**237.70**	**13.70**	**405**	**70**	**1630.66**	

Note: 1. Habitat protection area, 2. Key habitat, 3. Key habitat cooperation, 4. Valuable natural area, 5. Protection agreement, 6. Nature Reserve and 7. Archaeological and cultural remains

Sixteen summer grazing landscapes have at least one area of conservation importance. Two grazing landscapes have only archaeological and cultural remains, which are in point features (Table 3)

The percentage of summer grazing area covered by the area of conservation importance ranges from 0.06 to 41.70 % (Figure, 6). The area occupied by grassland biotope inventoried by TUVA is not included in this figure. One noticeable result, 54.62 % of land area of one summer grazing area, Sjöändan (Table 2) does not have even a single area of conservation importance.

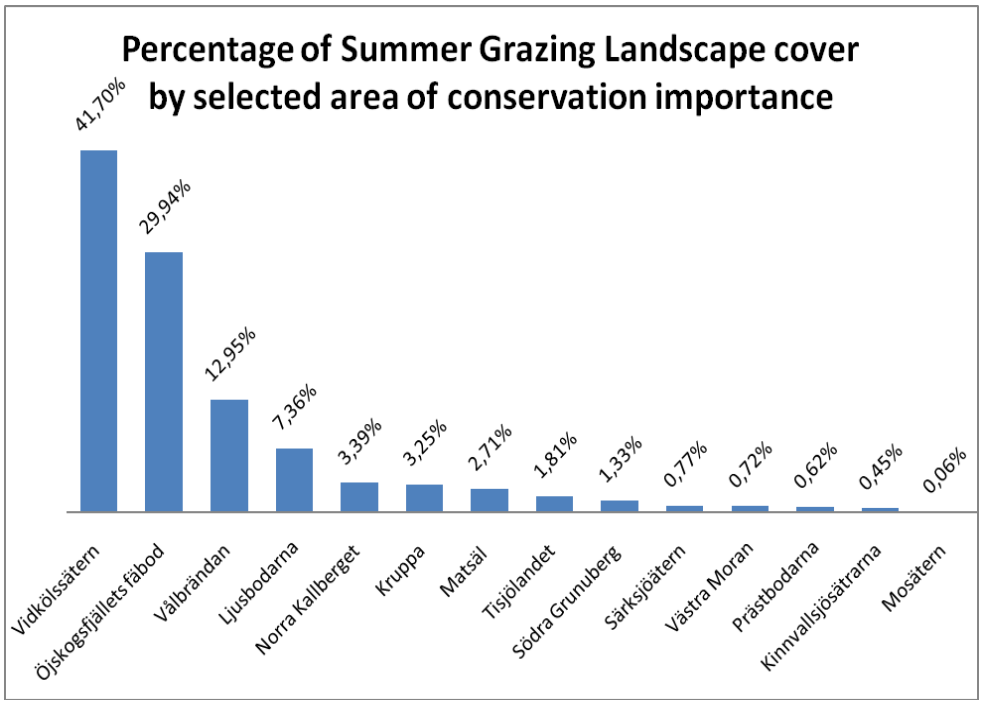

Figure 6: Percentage of summer grazing landscape covered by selected area of conservation importance

Chapter: Four

Discussion

This chapter will discuss the major findings of the study. The main question to be discussed is why a landscape approach is suitable for assessing the HNV of transhumant summer grazing practices of Sweden. The study shows that the natural and cultural values that exist in summer grazing landscapes are not confined to any particular land cover type.

The main purpose of this study was to analyse if the TUVA grassland biotope can represent the natural value of transhumance summer grazing practices. The results of my study suggest that the database cannot stand alone, and here I will discuss this in more detail. The first discussion is based on the fact that not all of the summer grazing farms present in this study did contain TUVA identified grassland. For the farms with TUVA grassland, it is apparent that the grasslands formed a very small portion of the area currently being grazed. In the second discussion I will stress that the summer grazing landscapes may contain many other areas of conservation importance in addition to the TUVA projected grassland biotope.

4.1 Fäbodvallen and TUVA grassland biotopes

All the studied grazing landscapes did not contain TUVA identified grassland biotopes. Hence it seems like there is a need for other alternative indicators to measure the HNV of current transhumance summer grazing practices in Sweden

Very small fragments of the summer grazing landscapes are covered by the TUVA identified grassland biotopes. But the results suggest that fäbodvallen, the head quarter of many summer grazing landscape is confined to the grassland biotopes.

Fäbodvallen is the area of the summer grazing land where the buildings are located. These areas were previously fenced from the animals until the hay was harvested (Dahlström *et al.* 2006). Now the fencing and protecting of hay is not common in all of the fäbodvall, i.e. some of the grasslands are grazed during the summer. The fäbodvall is considered as the head quarter of summer grazing from where all summer grazing activities are controlled. The cows are milked there, the milk processing is done there, and it is also the place for hay collection and animals' captivation. In some places tourists are served at the fäbodvall.

Even though the TUVA identified grassland biotopes contain fäbodvallen, no significant relation was found between grazing intensity and the distance from fäbodvallen. In this regard, the grazing patterns of the summer grazing landscape is not consistent with the general belief; i.e that the periphery area of the summer house is intensely grazed. In addition, the intensity of grazing does not show any significant relation with land cover type. In some summer farms, the surrounding forest areas are intensively grazed, whereas in other places, it is the river banks or the roadsides. The local quality of available forage quality could be the main reason for this; livestock visit preferred forage areas more often regardless of distance and direction from the farm house and the night quarters.

4.2 Area of conservation important in summer grazing landscape

The results of section 3.3 clearly show that there are several different important areas of conservation importance inside the summer grazing landscape including archaeological and cultural remains. The biological and cultural importance is apparent in different ways. For example, the presence of cultural and archaeological remains (stone wall, old building, mine area, or abandoned fäbod) shows that human activities took place in the landscape before present land-use and this is important part of the present value.

4.3 Landscape approach to cover value of grazing landscape

The results show that significant numbers of areas with conservation importance are found in the area of the summer farms and those areas covers significant proportions of the grazing land. This means that the nature value is not limited only to the fäbodvallen or the grassland biotope from where the grazing practices are operated. The biological, cultural and historical values of the area of conservation importance are related to the dynamic nature of human-nature interaction over time (Crumley & Marquardt 1990).

The value of different components of landscape is complementary to each other. For example, in transhumance summer grazing practices, farmers' stays in the open field/grassland, but do also allow their animals to graze in large areas around the summer farm. The surrounding areas might be forest, open meadows or marshy areas. The type of land cover type is not of primary importance, since each has its own value, a value that should be seen in relation to other facets of the mosaic such as fäbodvallen or the grassland biotopes from where the whole summer grazing practice is

operated. The value of some component might seem dominant regarding its direct importance, but we should not underestimate the importance of the elements it is associated with. The summer grazing landscape as well as the TUVA identified semi-natural grassland seems valuable because of its high biodiversity (Dahlström *et al.* 2006; Kull and Zobel, 1991; Montrimel, et at 1998) but each area cannot be assessed on its own. The surrounding forest area, which has been grazed for centuries (Dahlström *et al.* 2006), provides a mosaic containing various locally distributed elements shaped by the human-nature interaction. Eventually the summer farms will also get benefit from that long-term nature-human interaction. In summary, it can be said that the value of the associated grazing landscape elements should not underestimated in relation to the dominantly disclosed value of the TUVA identified grassland biotope.

4.4 The agri-environmental scheme and summer grazing practices in Sweden

The current agri-environmental scheme (2007-2013) of the Swedish environmental support system is predominantly concerned with the conservation of semi-natural grassland (both pastures and hay fields). Farmers get compensation for designated environment under different headings, including; i) restoration of pastures and hay meadows, ii) grazing and moving at remote location, iii) managing a mosaic of grazed pastures or including poor soils, iv) burning of grazed pastures v) hay handling on meadows, vi) Specific management of pasture grazing, vii) Fencing against predators, and viii) holding animals of local breeds. (Swedish Board of Agriculture, 2010)

The farmers have to follow specified management practices as a condition to get the support (Swedish Board of Agriculture 2010). The conditions to be fulfilled vary according to type of support applied for (ibid). Farmers' common perception about the support is that the administrative process to get support is unnecessarily long and cumbersome. Unfamiliarity with modern communication system could be a contributing reason for the discomfort with the application process, since most of the informants did not have internet access, and environmental support scheme basically favours e-applications (ibid).

The environmental agri-environmental scheme seems incompatible with the aim of conserving the steadily diminishing transhumance system. Farmers get support for fencing against predator (Swedish Board of agriculture, 2010). Building fences against predators limits the free grazing practice which is a main contributor to the maintenance of the biodiversity value of the landscape.

According to Sjölander-Linqvist (2009), the Swedish Government gives higher priority to wolf/bear protection than to the promotion of summer grazing practices. The increasing population of predators is putting the summer grazing practices at more risk, and local traditions and livelihoods are threatened by the increasing population of predators (ibid). Farmers hesitate to let their hunting dogs into the forest; children and women are afraid of getting into the forest for berry/mushroom picking and so on. Farmers reported that the numbers of sheep and goat is decreasing every year, since lambs are most vulnerable to predator attacks.

Chapter: Five

Conclusion and Recommendations

5.1 Conclusion

Incentive based conservation approaches are widely used to conserve traditional land use practices and maintain biodiversity. The major challenge is how to determine what components and which spatial scales that is appropriate for identifying the contribution of traditional land use practices to biodiversity conservation. The purpose of this study was to test the assumption that TUVA identified semi-natural meadows and grasslands can be the sole indicator to assess the high nature value of transhumance summer grazing practices of Sweden. Based on a study of twenty active summer grazing farms, the following conclusions can be made.

Transhumance summer grazing practices are complex in term of land coverage types and associated biological and cultural values. The area covered by the TUVA inventory of semi-natural meadows and pastures covers a small area of the total land maintained by a summer farm and is therefore not sufficient for assessing the overall natural value of summer grazing landscape. Existing transhumance summer grazing practices are not limited only to TUVA identified grassland biotopes. Various other landscape elements are crucial parts of a summer farm grazing regime and they should not be overlooked. The value of all land coverage types under one land management regime is the result of human and nature interactions extending a considerable time-period. Each land coverage type has its own importance and the values of different land coverage types are interrelated. Therefore it can be concluded that a landscape scale, going beyond the fäbodvall and

grassland biotope seems to be a more appropriate tool for identifying elements associated with a summer grazing farm.

5.2 Recommendations

Traditional land use practices are diverse regarding land cover categories, land use practices and the associated value. The overall value of TLUP can only be assessed if all the associated elements are taken in consideration. Hence, the landscape scale is strongly recommended as a holistic approach addressing heterarchy. Over or under-ranking of certain landscape elements might overlook the overall value of landscape. Incentive to the farmers for environmental services should be based on the integrated value of all landscape components incorporated under the same management regime. A method to derive an integrated value of all landscape components could be developed through a process of incorporating the knowledge, experiences and perceptions of land use practitioner about the importance of landscape component. Human perception must be included to make land use and conservation policies effective and sustainable. How people understand and react to changes and their attitudes should be crafted in designing the policy.

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