Problems and improvements in reindeer’s habitat

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[B.Sc. Thesis, Environmental Science, 15 Credits]
Abstract

Human activities like forestry are effecting the environment and the consequences and damages are creating problems even for animals. In last few decades, the use of forest by both commercial forestry and Sami people has increased conflict in northern part of Sweden. According to all the studies that have been done, modern forestry method like clear cutting is damaging the pasture areas that are essential for reindeer in winter time in order to reach enough supply of food. For example, it says in the studies that forestry makes the snow deeper and hard so that reindeer could not dig into and reach lichens that are covered up to 80% of their grazing area. The aim of this study is to find some alternative for Sami herders to support their animals in winter time by comparison between reindeer herding in Scandinavian countries and investigate how other countries have been dealing regarding reindeer herding. For instance, ILO convention 169 is one of the option that Sami people have in that Norway that they do not have in Sweden. That convention gives Sami people to participate in the decision that affect them. But in Sweden and Finland the case is different. In a situation, everything is difficult for Sami people from providing artificial feeding in a period of winter time which can help reindeer to have better conditions in winter time. However it is not an easy and cheap way and requires financial support from organizations like county administrative board. Thus, the focus of this thesis is on identifying the threats that are effecting the pasture of reindeer in Sweden and problems they are facing as well as finding out the appropriate solution to these issues and problems. Also, this thesis elaborate on comparison between the techniques involved in pasture of reindeer in Norway, Sweden and Finland. Thus, addressing these challenges and issues, this thesis identifies the problems and issues faced by reindeer during the winter season as well as viable solution of artificial feeding with some changes on cutting forest. Also, this thesis has compared the ways of herding reindeer during winter in mentioned three different countries. Hence, on conclusion this thesis tried to identify the problems and propose some viable solutions to that problems with comparing system in other countries.

Keywords: Forestry, Reindeer, herding, winter.
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1. Introduction

Ecosystem in boreal forests in northern Europe has supported human societies for millennia, mainly Sami people who are hunters and reindeer herders. And these forest ecosystems have been into radical changes during 150 years. One of the industries was sawmill in 1850s which enlarged and they required more Scots pine timber for that industry in northern Scandinavia. Major effects since that time was on landscape structures. Also logging and forest management methods like clear cutting and artificial regeneration have affected the forest ecosystem. Since 19s century, these development resulted in transformation of forest landscape [1]. Also climate conditions and increased consumption of forest resources and energy lead to higher pressure on forests. Forest industry requires producing more timber, paper and energy while protecting ecosystem, biodiversity and wild life was a big issue too.

Furthermore, modern forestry has had the most effect on Lichens which is the main food resource for reindeer in winter time. It take a long time for lichens to grow after they have been destroyed, they only have 10% of annual growth, and they need hold up to 120-210 and undisturbed forest type with spruce and pine. Now outside the northern forests in Sweden there are few of such old growth forest [2]. Lichens are exclusively susceptible to forestry, since many species are associated with specific conditions only found in old forest and it takes 100-400 for their growth [3]. In addition, modern forestry
would also alter density and depth of the snow cover which can make the ground lichens almost impossible for reindeer to access [1]. Both Sami and forest landlords use the same forest ecosystem but for different goals, and this result to conflict between them. Reindeer activities and forestry have been affected each other during last 150 years, landowners want to avoid the impacts on their land and Sami people want their reindeer to be safe [4].

1.1 Background and problem motivation

The units which organize the reindeer owners within the determined pasture are Sami Villages. There are 56 of Sami villages as in present situation. The concept is to organize the designated area and a settlement in the area. Sami villages are not permissible to participate in any economic activities other than reindeer husbandry. Every reindeer owner is a self-employed person and they cooperate to run Sami villages. For instance, the compensation money for reindeer that is lost are paid to the Sami villages which diffuses the money to the size of herd of each reindeer owner.

There are three conditions that are important for Sami and their reindeer:

1. Forest land accessibility, for example, to have permission to stay there.

2. Undisturbed forest with enough supply of lichens.

3. Old forest with good supply of tree pendent lichens [2].

Commercial forestry has had significant impacts on landscape structure in boreal Sweden which made it hard for these three conditions to meet. Lichens are up to 80% reindeers forage in winter and spring time and have been badly affected by forestry most. Modern forestry in northern part of Sweden has the major impact on reindeer herding which is the major business for Sami. It’s also conflicts problem between land owners and Sami people regarding the rights that Sami groups have for reindeer herding, hunting and fishing. Reindeer herding is a right that identified in the act on reindeer husbandry. The private lands are also for reindeer grazing but still the problem is the legislation does not state any obvious geographical boundary for validity of the rights. Thus some legal disputes are present today, where about 1000 private landlords
claim that, Sami don’t have right to graze on their property. They claim that their pine plantation is getting damaged by scrubbing their antlers against the small trees by reindeer grazing. Some of Sami communities had a financial compensate proposal but it does not work for now [2].

1.2 Overall aim

There are a lot of studies about this topic, both about how forest landscapes have been into changes and how reindeer have been affected by these changes and development. It is obvious that both forestry and reindeer herding are two important issues for Sweden from economic and cultural perspective and we can’t ignore them. The goal in this thesis is on how to make it easier for reindeer herders to access food in harsh seasons especially when modern forestry make it even difficult for them to reach enough supply of pasture? The thesis will study on how the reindeer’s population has been changed by different kinds of threats? Also is there any possibility that Sami people can find another alternative way to feed the reindeer? How the situations is different for reindeer herding in Norway or Finland? And Why?

1.3 Scope

The scope of this project is limited to the analysis of the problems for reindeer gazing during the winter time and procuring the suitable alternative solution for better lively hood for reindeer. This thesis explores challenges on herding of reindeer during harsh winter for enough food supply and pasture in Sweden. But also comparison of different techniques involved for reindeer herding in Norway, Finland and Sweden.
1.4 Problem statement
This thesis will estimate how reindeer population has been affected by modern forestry and how modern forestry affects the lichens that is up to 80% reindeer’s pasture resource in winter time. Also the thesis will study different type of problems and what kind of problem reindeer herders may have. And the concrete questions that will help us to find a way to improve reindeer herding are,

How the reindeer’s population changed during last century?
What are the threats to reindeer herding?
Is there any possibility that Sami people can replace lichens which is reindeer main pasture with some other vegetation in winter time regarding the difficulties that snow and clear-cutting create for reindeer grazing?
How reindeer herding in Norway and Finland differ from in Sweden?

1.5 Outline
This thesis is outlined in following manner. Chapter 1 of this project or thesis describes basic insight to the thesis with problem definition whereas chapter 2 is related works explaining the background and theoretical knowledge on the subject. Chapter 3 represents methods followed to achieve the defined goals. Chapter 4 shows the results obtained whereas chapter 5 express the analysis on the result obtained. Chapter 6 gives the conclusion on the thesis with discussion.
2. Theory

In this section background study, theoretical research and related works in this thesis is presented. This section provide introduction to forests, sustainable forest in Sweden as well as administrative board for reindeer.

2.1 Swedish Forest

Northern part of Sweden is covered with forest about 9.4 million hectares and forest sector is one of the important parts of economy in Sweden. 70% of Swedish land is forest. 286000 km square is main forest with native species Pinus sylvestris, Picea and Betula pendulda. Forest industry is essential for national economy and for the biggest net export income. Family enterprises own about 50% of the forest in Sweden in 2010 and there were approximately 330000 owners, 62% of which were men and 38% were women [5].

The total land area is 40.8 million hectares which is divided into 22.5 million hectares of productive forest land, 4.4 million hectares bog and marshland, 0.9 rock surfaces, 3.5 mountain and alpine coniferous, 3.4 cropland and grazing land and 4.2 protected area within national parks and natural reserves [5]. Forestry was introduced to the northern Sweden first in the late 19th century in the form of high-grading of the larger trees and later as sustainable forest management.

Environmental quality objectives and temporary targets for sustainable development have been adopted by Swedish parliament (Riksdag). The objectives determine the quality and state of Sweden’s environment and its natural and cultural resources. The government contains entirely responsibility for environmental quality targets and goals. SEPA (Swedish environmental protection agency) harmonize follow-up, procurement of information and use of economic impact assessments within the environmental objectives system [5].

2.2 Sustainable Forest Management

Sustainable forest management is both about preserving the quantity of forests for future generation and respecting the ecology, the biological diversity, living species and all the communities affected by the forest.
Sustainable forest management shall keep the balance between economic wood industry and wildlife and vegetation and local interest.

Swedish forest is leader in world as third largest exporter of sawn timber products and also the fourth largest of world on exporter of paper and pulp. Swedish forest industry is the second largest exporter of these products in the world [6]. The industries which take place in Swedish forest have an important role in the country’s economy. Forest sector provides 11-13% of the total employment and 11% of export in industry [7].

2.3 Forest for Reindeer

The forest area is also for about 230000 reindeer grazing, these reindeer population distributed among 4700 herders which these owners are organized in 51 Reindeer herding Communities. Reindeer is important both economically and culturally for Sami people. The reindeer were used for different purposes, e.g. transport, food (milk and meat), clothing and sinews for strings. This wide range of reindeer’s usage made them vital for Sami life and culture. Reindeer meat is one of the best low fat meat for human health and popular in Scandinavian countries. Reindeer are herded by several people groups, the Nenets, the Evenki in northern Siberia, the Sayan people in southern Siberia and the Sami in northern Europe. And for thousands of years, people’s survival in harsh winter time in tundra and boreal forest Eurasia has been connected to reindeer.

Sami people live in boreal forest in Norway, Sweden, Finland and Russia and reindeer husbandry for them is important both economically and culturally. In northern Sweden the exact starting time of reindeer domestication is not clear, but it is obvious that reindeer husbandry was started in some areas by 16th century in small scale and since 20th century reindeer herding increased to a larger scale [8].

In the past Sami people used skis to move reindeer for winter grazing. Using frozen rivers as migration trial, dogs were used to keep the herd together. But today snow mobile, helicopters and Lorries are the tools to migrate reindeer. The society has been upgraded for efficient and easy access and thus results in different style of herding for reindeer but their main need is still the same: need of food [2].
Reindeer spread in mountain area during summer and in boreal forest during the winter time. Reindeer population differs in different periods based on grazing and climate issues (Sustainable forest management system in Sweden 2009). In snow-free seasons they graze on a different kind of plant species and graze mainly grass, leaves, herbs and fungi and in winter time. Their pasture source is lichens which have a high level of carbohydrate even in cold seasons. Reindeer have a special microbial flora in their stomachs that help them to digest lichens [8]. They are well adapted to snow and cold weather [2].

2.4 Reindeer husbandry management in Sweden

In Sweden Reindeer husbandry is practiced in Norrbotten, Vasterbotten and Jamtland. The reindeer management system in Sweden is showed according to figure 3, the highest level is the ministry of agriculture. It is responsible for all coordinating related to Sami issues. Most of the decisions concerning the reindeer husbandry are represented to the Swedish Board of Agriculture [9].

![Diagram](image)

Figure 3: National management of reindeer husbandry in Sweden [9]

2.5 County Administrative Board

The County administrative Board of Jamtland, Vasterbotten and Norrbotten, is the executive authority on reindeer husbandry within the Swedish management system. They are in charge for the contact with Sami villages. They control the maximum number of reindeer on different pasture area, based on survey in cooperation with Sami villages determine the number of predators, and the number of reindeer lost due to predators which is paid compensation for.
There is one expert on reindeer industry in all county administrative board. Also, the county administrative boards are the secretariat for reindeer industry delegation. This board include of seven members that three of them are reindeer owners.
3. Methodology

In this chapter, a solution to the problem statements stated in chapter is explored using different techniques. Also different perspective on the condition of reindeer herding is evaluated. The related work is divided into several different phases. As discussed in chapter 2, gives an insight on sustainable forest and current method of reindeer herding in northern Sweden. So, the work is categorised into literature review, collecting different information from different organizations and questionnaire for more precise result. Hence following are the different sections with respect to approach taken to get the result as discussed in chapter 4.

3.1 Examination

This was the initial point of this thesis which involved in generating the basic knowledge on the background of the topic. It included various examination, literature reviews, different published papers, web research, and other different tools. A review was done on the subject of reindeer herding and different problems in different part of the country. Likewise, detail study on the situation of reindeers especially on the northern part of the country was conducted to point out various reasons and aspects that are still a concern in those area of reindeer herding. Along with this study, this thesis also based on previous study on this topic.

3.2 Collecting Data

It is the second stage during this thesis which contribute most. It involved in gathering different data and information from the previous studies regarding the situation of reindeers. It also included contacting different governmental offices such as Skogsstyrelsen, Länsstyrelsen, Foder Centraleten and Sami Parliament for more statistical data and information on reindeer.
4. Results

4.1 Artificial Feeding

Artificial feeding of reindeer has been practiced in southern Finland for a long time ago during 1980-82 in winter time. They were fed with lichens, hay, dry molasses pulp and some other feeds with different amount of protein and nutrients. They got lower body weight, blood and fecal N compared with the group that were fed by lichen, but they survived and also higher values were measured in the groups that were feeding with dry or ground hay, dry molasses pulp, oat bran and other commercial feeds [10]. The big issue about artificial feeding would be the financial issue. Money is always the first question in any improvement and the question arises, who shall pay for that? The organization of Feeding center in Vasterbotten was contacted to figure that out which showed artificial feeding cost 5 SEK per day for each reindeer resulting into the cost of 2250 SEK per reindeer for five months of feeding.

According to Reindeer Ordinance (1993:384) paragraph 35, subjected to availability of funds, grants can be given to a Sami village to partially cover the cost of feeding caused by extremely difficult grazing conditions. The fund is managed by the state administrative authority Kammarkolegiet. This company provide financial advices and management. The compensation money comes from the fee that hunters and fisherman pay as fee to länsstyrelserna.

Another perspective is to save the forest and young plants that landowners are worried about. Reindeer can damage them by over grazing and it has both environmentally and economically consequences. If artificial feeding could be expanded, the conflicts between forest owners and indigenous people would decrease since both can save their properties, however Sami people would still be unsatisfied about their right to use the land for their reindeer herding.

The other issue is the health problem for the herd which arises question on if there is any difference on grazing naturally or artificially?
Traditional emergency feeding is arboreal lichens, but they are not available because of modern forestry as we mentioned before. Ground lichens are as an alternative which in 1998 they were applied to 40% of Swedish reindeer herding, however those feed stuffs made health problems for reindeer and there was a need to provide better feeding methods for these situations. In recent years is has become more common to provide extra nutrition for the herds to save the animals from death. Reindeer need carbohydrates, fats and protein and the need of energy for reindeer depends on the size, activity, growth and possible production of fetuses and milk. Minerals such as phosphorus, potassium and magnesium are the important ones for reindeer also. In addition to, reindeer need vitamins like people that they can get from pellets. The essential nutrient is water and they just can live without it a couple of days. Reindeer which are fed by dry food must drink 3-5 liters water or 3-5 kg of snow. [11]

The best that we can give reindeer are lichen, hay, silage. Lichens contain lots of energy but little proteins and they seldom cause stomach problem for reindeer. Hay and silage has been supplementary feeds for reindeer in a long time but they should be combined with some other feed since if reindeer only eat one of them, during long time, they may die from malnutrition despite the rumen is full of food because silage and hay don’t have high digestibility for the reindeer [11] clears such as wheat, barley and oats are important in finished compound feed also (pellets).

According to Anna Nilsson’s experiment that was about artificial feeding of semi-domestic reindeer, all the animals appeared healthy during the pre-experiment and no problem was showed adapting the reindeer to feeding. The animals stayed healthy through the study. In some cases diarrhea occurred in the initial phase of the feeding but all the animals recuperated and just a few of them had to take antibiotic.

4.2 Predators

Reindeer owners have a lot of problems in herding reindeer in different accepts in all Scandinavian countries as we mentioned earlier, like grazing limitation in cold seasons and plus according to Sami people the main threats to reindeer herding are predators and modern forestry methods such as clear-cutting, which has the most effect on reindeer
pasture areas in winter time and these two threats in Scandinavian countries are kind of in the same level of concern.

Wild animals in Sweden are mostly wolfs, wolverine, bear and lynx which are the predators of reindeer. But wolf and wolverine are protected animals and under threat of extinction nobody is allowed to kill them even if they are counted as predators to reindeer [12]. But the compensation for loss of reindeer due to predators is about 20% of the average reindeer owner income from reindeer husbandry. This compensation system in Sweden is based on the occurrence of different predators inside one grazing area is working well, but to make it work better the compensation can be on a fixed price on every reindeer.

According to the problem that reindeer have in northern part of Sweden regarding to forestry and its impacts on grazing area, and cold winter and snow that make it difficult for reindeer to access enough supply of food and loss of pasture lands, we have been investigating if there is a possibility that herders can replace lichens with some other vegetation to feed reindeer. Around 200000 reindeer live in northern part of Sweden which providing artificial feeding for them must be quite expensive but is possible [2].

Due to low nutrient intake by reindeer in winter time, they are in quite poor condition. We can say they are in starvation situation in cold season with snow and ice. And that makes everyone to think about emergency feeding.

4.3 Comparison in reindeer herding in Finland and Norway

The number of reindeer and pasture in Sweden, Norway and Finland are quite close to each other. In Norway, in 2001, 165000 reindeers were grazing on 140000 square km. In Sweden in 1998, 227000 reindeers were grazing on 160000 square km and the figures for Finland in 2000 are 186000 reindeer grazing on 114000 square km [9].

Norwegian concept for reindeer management system is known as “husbandry unit”. A license is given on the process to one person in order to own reindeer and to be part of reindeer district legally. One family can have more than one husbandry units. In Swedish system, it is the same function but the license is connected to the membership of a
Sami village. And in Finland unlike Sweden and Norway reindeer husbandry can be performed by all citizen of Finland.

The trend of reindeer number indicates similar changes in these three countries. In late 1970s, it shows an increase in animals, a peak between 1989 and 1991 and the trend has been a steady reduction of herds after 1991. This reduction of the reindeer is mostly because of instructions from the national authorities, partly the influence of predators and understanding from the owners that the number of the reindeer in 1989 was not on a sustainable level. This problem in Scandinavian countries is almost the same.

Reindeer are herded over an area about 40% of Norway and is regulated by “Norwegian Reindeer Herding Act”. Reindeer management system in Norway is similar to other Nordic countries but there are some specific characteristics.

The reindeer industry major cost is about mechanical equipment like transport, cars, helicopter etc. These are important in daily work for reindeer owners to be able to keep up with the herd and are capital intensive tools also. Migration between pastures is difficult due to an increase in infrastructure and this makes the owners move their reindeer by car. This way is easier and save animals but also it means extra cost for herders. In some area, transporting reindeer by car is the only option since it is impossible to get reindeer from one pasture to another one.

Loss of pasture is one of the threats to reindeer husbandry according to the most of reindeer owners. During last 60 years, a human impact on pasture area is not only problem in Norway but also in northern part of Sweden and Finland, they created difficulties for indigenous people and their way of life.

4.4 Reindeer husbandry management in Norway

There are 6 Reindeer Pasture area East Finnmark, west Finnmark, Troms, Nordland, North Trondelag and South Trondelag/Hedmark. There are also some Concession Areas outside the main pasture areas, where both Norwegian and Sami are reindeer owners. In Norwegian
reindeer husbandry board, the Ministry of Agriculture is responsible for,

1. The division of pasture areas
2. The question concerning the entitlement to reindeer husbandry
3. The permission to practice reindeer husbandry outside the main reindeer pasture area
4. The approval of fences and installation

According to Norwegian Reindeer Husbandry 96% of the losses of reindeer is predators and 4% is connected to bad grazing conditions and trains. In Norwegian system the compensations are granted for loss of reindeer due to these reasons. The authorities in Norway put reindeer husbandry under pressure due to heavy grazing over several years, it comes from an increase number of predators and development of infrastructures on the pasture area. Also the requirement of the compensation system concerning the ground for repayment does not match the claimed losses, 80% of the claimed losses regarding to predators were not approved in 1996-2000. The important challenge for reindeer industry and national authorities concerning the loss of pastures area is to start a useful dialogue due to improve a co-existent system (Reindeer husbandry in Norway).
The number of reindeer has been decreased from about 218,000 in 1992 and leveled down to 165,000 in 2001. The reasons regarding this reduction are first the management plan for a reduction of reindeer to save the pastures, the second reason is the a growing number of predators and the third one is several sever winters that made the grazing conditions too difficult for the reindeer.

4.5 Reindeer husbandry management in Finland

Reindeer herding area in north and northeast in Finland in the province of Lapland and some parts of Oulu province cover about 114,000 km2. The working process in Finland is different from Sweden and Norway.

There are 56 reindeer herding, and each of the herd has its own administration, which has a leader who is reindeer owner. Reindeer husbandry is governed by the herding co-operative system. Reindeer owners are all member of a herding co-operative, and their respective responsibilities and rights are specified on the ground of the number of reindeer owned.

4.6 Association of reindeer herding cooperative

Association of reindeer herding co-operative – Paliskuntain Yhdisty is the central body which to be a member there is free and activities in this association are founded by the State budget. General meeting in the association which is called Reindeer parliament take the decisions in the matter of reindeer. The parliament composed of chief of districts and is assembled once a year. Their main responsibilities are the association’s annual report, accounts, operation plan and financial plan for the next
year. The board of the parliament includes, chair, vice-chair and 12 members who are elected every third year. Ministry of Agriculture and forestry regulates the total number of reindeer, and sets a maximum number of reindeer that each herding co-operative can own in a decade. The highest number of reindeer is 203700 which is regulated by the Ministry of Agriculture and Forestry.

Figure 6: Association of reindeer herding cooperatives[9]

The number of reindeer in Finland had a reduction by 13% in 1993-2000, there are different reasons for this reduction which the first on is to adjust the number of reindeer with the pasture area. The second could be harsh winter and difficulties to access food for reindeer. The other explanation is the predators and the last one is the decrease of reindeer owners.
Reindeer herding situation in Finland in general is the same as in Sweden and Norway. Loss of pastures and predators are two majors concerns in reindeer husbandry. Modern forestry has a significant impact to 75% of the reindeer which their main pasture area is in the forest especially in winter time. But Finland has not approved the ILO convention 169 (legally binding international instrument to approval, which deals specifically with the rights of native and tribal people (international labour organization)) and finish government has been criticized by the European Human Right Commission not to consider the questions about Sami rights in Finland. Both Sweden and Finland are encouraged to harden the work towards an approval of this convention. But still we can not say that reindeer herding problem is solved with approving this convention.

The development trend for reindeer owners in Sweden have a small reduction by 2.1% that is about 100 persons in the society as compared to the reduction in Finland by 16% or 1000 persons the situation in Sweden is constant. And in Norway also the development of reindeer owners with a slight increase of 4% counted as stable situation.

The development of reindeer population in Sweden in 1900-2009 in total is something similar to reindeer population development in Norway from 1970s to the end of 1990s. The trend has been a fixed increase in reindeer population in the beginning of 1980 until 1990 and since 1990 to 1998 their population has been decreased every year.
Chernobyl accident in 1986 is another explanation for decreasing reindeer population in Scandinavia, especially in Sweden. That accident caused too high content of radioactivity in reindeer meat and result to collapse in the Swedish reindeer meat market. This resulted to rapid increase of the number of reindeer on the pastures. There was a need to reduce the reindeer population and this reflected in reduction in the statistic [9].

![Figure 8: Total number of reindeer in Sweden 1900-2009.][9]

### 4.7 ILO convention 169

Reindeer husbandry management systems in general are similar in Sweden, Norway and Finland to each other with a bit differences in organization forms, and how indigenous and ordinary people have the membership in reindeer ownership. But the superiority that Norway has in reindeer husbandry is that they have ratified ILO convention 169 which has numbers of principles which non-discrimination is the first general fundamental principle. Due to this principle, indigenous people have the right to encompass the full measure of human rights and freedom without impediment or discrimination. And the other important principle is Consultation and participation, the convention demands that tribal and indigenous people are consulted on issues that affect them. It also demands that they are able to be involved in free, prior and informed participation in policy and development processes that affect them (international labor organization). According to Sami people one of the ways to go forward which is political and practicable is pressuring in Swedish government to ratify ILO convention 169.
That means they are hopping to participate the decisions that affect their life. This convention will give the same rights and opportunities as ordinary citizens in the society; however it would not be the final solution for the problems that Sami people have regarding the conflicts with landowners.

This convention is supposed to be used as a tool to motivate dialogue between governments and indigenous and tribal peoples and in this way to improve their situation. There must be a place for Sami people that can speak about the issues that affect them, by this convention they would participate in the decisions which modify the situations for their herds.

We cannot say that forest companies are not following the forest regulations, Sweden is one of the countries with a long forestry tradition and high ambitions with regard to sustainable forest management. But as we said before, wood industry plays a big role in Swedish economy and by ratifying ILO convention 169 forest industry would not be able to cut down the trees without Sami’s permission. It means signing this convention is too expensive for Sweden. But reindeer pasture area would be kept safe for Sami’s reindeer.
5. Discussion

Reindeer owners have a lot of problems like predators’ existence, cold winter, use of untouched grazing lands and modern forestry that even make it harder for them in grazing issues. Also ignoring Sami people’s right regarding the usage of land in some cases can be a reason of this reduction. Leaving old growth trees during logging operation is one way to improve the production of landscape to a greater extent. By this method in clear cutting, old trees would be left for lichens to live and reindeer would have more access to their diet in winter.

According to most of the studies that have been done and information from Sami parliament members (Anna Skeilta), artificial feeding is one of the best ways to go forward to save reindeer in cold seasons. In country like Sweden that forest industry is counted as an important sector, apparently the only way to improve reindeer husbandry is to provide them emergency feeding. Of course, this is not the best for Sami people since they get limitation for their herding by modern forestry. Reindeer can be fed hay and silage and lichens are a good source of carbohydrate and energy that reindeer need in winter time. And fortunately it is possible even to buy lichens from the feeding centres. So it is better to use all of them to make sure the animals get the nutrition that they need.
According to Lansstyrelsen, the number of reindeer in every herd should be at least 500 that the family can live on the herd economically. And we assume that the herder should get help of artificial feeding for 2 months in winter, the budget that they should apply to get from county administrative board is about 150000 SEK. The comparison between the size of forest in Sweden, Finland and Norway, we can say that they all have same kind of problems but since Forest industry in Norway is not as big as Sweden, about 38% of Norway is covered by forest. And 15% of the productive forest land is counted as non-economic operational areas due to long distance transport and difficult terrain that means that economical forestry may only be practical in approximately 50% of the forest. Also Norwegian government ratified ILO convention 169 so assume that Sami people there should have better condition in reindeer herding because they can be part of the decision that they concern about.

A better management in forestry methods like leaving old trees in clear cutting method for reindeer can help a lot to conserve lichens in cold seasons. This is the first step that can help to save reindeer grazing area. The other way is artificial feeding which requires budget from organization like county administrative board and it is expensive for Sami people to do it on their own. Financial help for Sami people is really important because they should be able to solve their problem somehow otherwise they have to leave reindeer herding. The other problem which Sami people encounter is that they can’t participate in the decisions that affect them, and they have to pay complementation for the activities that the other organizations are doing like clear cutting and that affect lichens which are the main food resource for reindeer in winter time. In Norway Sami people can be part of the decision making. On other hand, Swedish government could ratify ILO convention 169 which can help Sami people to secure their remaining grazing area and reduce the cost that they had to pay for emergency feeding. This indigenous people are living on reindeer herding and have the right to participate on the matter that affect them like other people. There is a trend of reduction of reindeer owners and reindeer due to a lot of problems which can have improvement by considering reindeer herders’ right and wills.

Reindeer are one part of biodiversity and their food resources are affected by cold winters, and forestry make the problem worse. Providing artificial feeding is possible but expensive that requires
financial aid from the governmental agencies. This support can help them the animals to get enough food and survive in the winter time.

The reindeer number in Sweden is the same in average in 100 years but actually reindeer are victims of human activities in the forest now. Maybe it is expensive and difficult to end or reduce these problems that exist but these indigenous people groups have right to live and keep some untouched grazing area to save their culture and animals.
6. Conclusions

From this thesis it can be concluded that reindeer are facing difficult situation during the winter season due lack of pasture and herding area and available food. This is an important issue since reindeer are part of ecosystem as well as economic aspects of people living in northern part of Sweden. Different methods can make the situations better for reindeer like artificial feeding which is practicing already by herders but that needs more financial help from government.
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