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Livestock Management in Traditional Rural Biotopes in Finland

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MASTER'S THESIS

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Summary

The aim of this study was to investigate the methods professional landscape managers use when they are gathering and handling cattle and sheep in traditional rural biotopes in Finland. An experiment how wind affects animal movements were also done.

25 farmers using biotopes as pastures were interviewed. Observations was made in eight biotopes in summer and autumn 2016. Wind effect was studied by putting a GPS-tracker to one cow and a weather station was used for getting information about wind speed and direction.

It became clear from the interviews that the two main methods were pushing and pulling. Pulling was done with feed as help. Pushing was done mainly by humans. In Ostrobothnia and Northern Ostrobothnia also quadbikes, jeeps or tractors were used. In Southwest Finland in a few locations cattle could walk back home from the traditional rural biotope.

Pushing was always used when handling sheep. It was common to use working dogs. If pulling was done with bread or a bucket of oats, some pushing was anyway included.

Different methods need different resources. Those who used pushing as a method when gathering cattle or sheep needed less workers for the job than those, who both pulled and pushed. One explanation for the observed differences in working times was the need of building temporary fences and pens.

Wind is affecting how animals are moving. Knowing that cattle in first hand moves in headwind can mean noteworthy time savings in large traditional rural biotopes.

Language: English

Key words: livestock management, traditional rural biotope, wind

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EXAMENSARBETE

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Abstrakt

Syftet var att undersöka de metoder – och de olika resurser de kräver – som professionella boskapsägare använder i Finland när de samlar och fångar in sina djur från vårdbiotoper. Vindens betydelse för djurens rörelser på biotopen undersöktes.

25 djurägare från Egentliga Finland och från Österbotten eller Norra Österbotten blev intervjuade. Åtta observationer gjordes i fält under sommaren och hösten 2016. Vindens betydelse analyserades med hjälp av en GPS sändare fäst på en ko samt med uppgifter från en väderleksstation på området.

Från intervjuerna framkom att huvudmetoderna för att samla in djur skedde genom att locka eller fösa. Då djuren samlades genom att locka användes mat som lockbete.

Oftast var det människor som föste djuren till fållan. I Österbotten och Norra Österbotten användes fyrhjuling, jeep eller traktor vid fösning av djuren. I Egentiliga Finlad lät en del sina nötdjur komma själv gående hem från biotopen. Några åkerbeten kunde betas under vägen hem.

När det gällde får användes alltid någon typ av fösning. Det var lika vanligt att använda en vallhund som att enbart människor föste djuren. Om lockandet med bröd eller havreämbare användes var det alltid kombinerat med fösning.

Olika metoder behöver olika insatser och resurser. De som använde enbart fösning vid fasttagning klarade sig med färre medhjälpare vid insamling av både får och nöt än de som både lockade och föste. En stor skillnad i arbetsmängd utgjordes av hur mycket tillfälliga ledstängsel eller fållor som måste byggas.

Vindriktningen har betydelse för djurens rörelser på biotoperna. När biotopen är stor kan det innebära stora tidsbesparingar att veta att djuren rör sig främst i motvind.

Språk: engelska

Nyckelord: hantering av betande djur, vårdbiotoper, vind

OPINNÄYTETYÖ

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Tiivistelmä

Tutkimuksen tarkoituksena oli selvittää suomalaisilla luonnonlaitumilla käytössä olevia toimivia tapoja laiduneläinten käsittelyyn ja kiinniottoon. Myös tuulen merkitystä eläinten liikkeisiin tutkittiin.

25 eläinten omistajaa, jotka käyttävät biotooppeja laitumina, haastateltiin. Kahdeksalla biotoopilla tehtiin havaintoja käytännön tilanteista kesällä ja syksyllä 2016. Tuulen vaikutusta karjan liikkeisiin tutkittiin seuraamalla yhden naudan liikkeitä GPS-lähettimellä ja tuulitietoja alueelle sijoitetusta sää–asemasta.

Haastatteluista selvisi, että eläimiä koottiin joko niitä painostamalla taikka houkuttelemalla. Kun eläimiä houkuteltiin, se tapahtui rehulla. Painostaminen tapahtui enimmäkseen ihmisten toimesta. Pohjanmaalla ja Pohjois-Pohjanmaalla käytettiin myös apuna mönkijää, jeeppiä tai traktoria. Varsinais-Suomessa joillakin oli mahdollisuus antaa eläinten itse kävellä biotoopilta navetalle. Matkan varrella voitiin laiduntaa sopivia peltolaitumia.

Lampaita käsitellessä käytettiin aina jonkin tyyppistä painostamista. Paimenkoiraa käytettiin yhtä usein kuin pelkästään ihmisä. Mikäli eläimiä houkuteltiin leivällä taikka kaura-ämpärillä jonkin asteista painostamista oli kuitenkin mukana.

Erilaiset menetelmät vaativat erilaisia resursseja. Eläinten käsittelyssä painostusmenetelmää käyttävät tarvitsivat vähemmän työntekijöitä sekä nautojen että lampaitten kokoamisessa kuin he, jotka sekä houkuttelivat että painostivat. Suuri ero tilakohtaisissa työajoissa selittyi myös tilapäisten johdinkujien ja kiinniottoaitausten rakentamisessa.

Tuulen suunnalla on vaikutus eläinten liikkumiseen biotoopilla. Suurilla luonnonlaitumilla tieto siitä, että karja liikkuu ensisijaisesti vastatuuleen voi tuoda merkittäviä ajansäästöjä karjan käsittelyssä.

Kieli: englanti

Avainsanat: laiduneläinten käsittely, luonnonlaidun, tuuli

Table of contents

1 Introduction

1.1 Background

What can be a more relaxing scenery than cattle lazy grazing on a green pasture with grass undulating in the wind and some solitary trees giving shade? When you imagine that view you can almost hear also the birds and beas and feel how the sun is warm and a nice breeze is fondling your cheek. That is what the traditional rural biotopes are: a dynamic place for many species and a beautiful landscape for humans to admire.

Why traditional rural biotopes?

As a member of EU, Finland has engaged to halt the biodiversity loss by 2020 (European commission, 2016; Pakkanen, Raatikainen & Mussaari, 2015, 7). According to the Environment.fi – web pages the traditional rural biotopes are the proportionally (93%) most threatened habitat types in Finland (Environment.fi, w.y.). Rassi, Hyvärinen, Juslén and Mannerkoski (2010a, 685) and Pakkanen et.al. (2015, 7) claim that 23% of endangered species are dependent on these areas.

Therefore, focusing on these ecologically remarkable areas in nature conservation and management is especially profitable and important. According to Pakkanen et. al. (2015, 7), Pykälä and Bonn (2000, 8) and Vainio, Kekäläinen and Alanen (2001, 6) traditional rural biotopes can be classified as different meadows or wooded pastures. The common thing is that they have been formed under human management over a long time. These areas were not so productive and were therefore left as pastures for horses, cattle and sheep. (Environment.fi, w.y., Biodiversity.fi., w.y., Vainio et.al. 2001, 28–30.). Over the years the way of farming has changed and these areas have not been used for livestock grazing any longer. However, they still have marks from that time. (Raatikainen & Raatikainen, 2014, 5).

The traditional rural biotopes in Finland need more effective management in form of reconditioning, mowing and grazing (Pakkanen et.al., 2015, 7, Raatikainen & Raatikainen, 2014, 7) with yearly mowing and particularly grazing being the most important actions (Pykälä & Bonn, 2000, 63). Using grazing livestock preserves natural and cultural values and supports biological diversity (Mithcell & Rössler & Tricaud, 2009, 22; Hägg, Degerman, Pessa & Kovanen, 2006, 17). The Finnish national goal is to have at least 60000 hectares' biotopes that are taken care off by 2020 (Kemppainen & Lehtomaa, 2009, 6, Rassi et. al., 2010b, 108).

Where are the traditional rural cultural biotopes located?

Raatikainen & Raatikainen (2014) have compiled a report about traditional rural biotopes located on state owned land in Finland. Most of these objects were in Northern Ostrobothnia, Southwest Finland and in Lapland (Figure 1.). They located altogether 15 210 hectares of valuable biotopes. Over 80 % of this area was not managed. Little over 3000 hectares of this total area were small objects under one hectare. However, 23 objects were bigger than 100 hectares each. In average the biggest objects were in Southern Ostrobothnia, Ostrobothnia and in Kainuu. (Raatikainen & Raatikainen, 2014, 26). According to Pakkanen et.al. (2015) traditional rural biotopes located on private land in Finland in 2013 were 259 805 hectares. Of these were in Northern Ostrobothnia (over 4 700 hectares), in Ostrobothnia (3 300 hectares) and in Southwest Finland (around 1 400 hectares) (Figure 1.). (Pakkanen et.al., 2015, 12, 14).

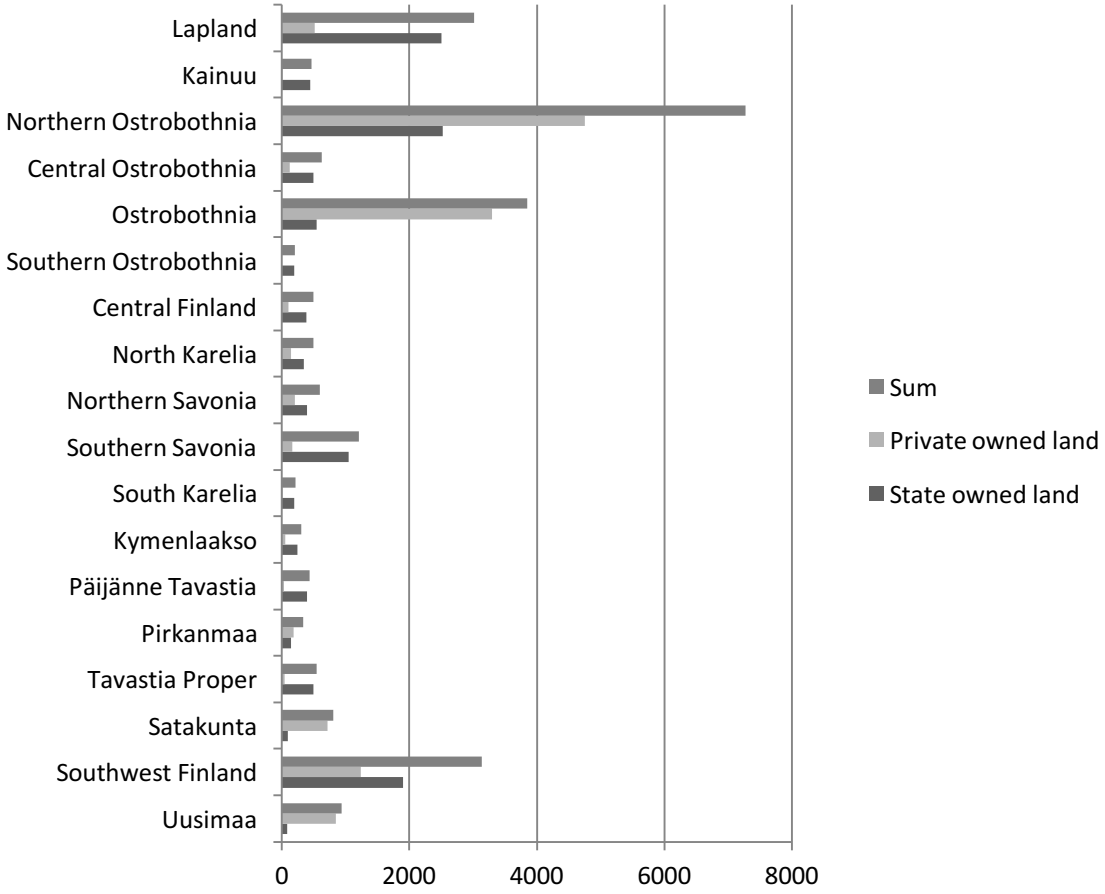

Figure 1. An estimation of state owned traditional rural biotopes (Raatikainen & Raatikainen, 2015, 25) and private owned traditional rural biotopes in nature reserves (Pakkanen et. al. 2015, 13) in different regions presented in hectares.

Managing the traditional rural biotopes

About half (5 300 ha) of the traditional rural biotopes located on private land are managed with specific support for the agriculture (Pakkanen et.al., 2015, 20).

Some of the state owned traditional rural biotopes have been rented to farmers as pastures. A lot of these areas are in Northern Ostrobothnia and in Southwest Finland. (Raatikainen & Raatikainen, 2014, 10, 33). When the goal is to maintain the richness of nature, large and whole biotope areas are to favor in front of small (Pykälä & Bonn, 2000, 62). It is clear, that no human effort can take care of these areas without using grazing animals (Huuskonen, 2006, 8). Without EU based environmental support this would not be possible. It is the most important form of funding. (Raatikainen & Raatikainen, 2014, 11). Managing these areas, especially the large ones, by using grazing animals cause practical problems that many farmers are speculating about before signing the contract. One difficulty is how to gather back the animals from the sites. Focusing on livestock management in the traditional rural biotopes is because of that this is a key question when Finland is trying to halt the biodiversity loss by 2020.

Wind is a well-known factor impacting on many aspects of animal movements, for example bird migration. The farmer in Australia, where I did my practice knew how sheep were moving in wind and reindeer herders in Finland take account of wind circumstances when managing reindeers (personal communication with Koivumaa Nov.19, 2016). Knowing how wind effects on animals can help managing even livestock in traditional rural biotopes. Time savings can be remarkable if the farmer understands how livestock is moving in ‘wild’ circumstances.

1.2 Previous research

Previous studies have handled a lot about animal behavior and feeding both in Finland and other countries. The standpoint has mostly been the animal: its welfare and nutrition. Also, studies about growth rate of calves and milk production when having different kinds of pastures have been in focus. Puumala (2006) has made a comprehensive study about handling facilities for beef cattle in Finnish conditions. Kuusela (2004) has studied grazing management of organic dairy cows in Finland. Her focus was in plants and milk production. Cultivating grass as silage, hay or pasture has also been investigated in many

researches. When researching particularly biotopes the main interest has been the vegetation, conservation and different species living in that habitat.

Wind and how it affects animals moving has been studied a lot in the context of bird migration. Alerstam (1979) found out that stable following winds are optimal for long non-stop flights and rapid wind changes allows only short flights. Åkesson and Hedenström (2007) again discuss about how bird migration is a process of fueling, locomotion and optimal use of for example winds. Birds, especially smaller birds and insects, when trying to maximize their migration speed, choose to depart with weak or following winds. The cruising altitude again was determined by the relative strength and direction of the wind. In a whole, wind has a big impact for migratory performance and orientation for birds. (Åkesson & Hedenström, 2007). Gene Wensel (2009) is not a scientist but a bow hunter, who has studied how wind affects the movements of deer. In his book *Buckskin and Bone – Postgraduate Whitetails* (Wensel, 2009) he shares his observations how deer move in different winds. The most important sense for prey species – as whitetail deer – is their noses. In his experience wind speed is an important factor. When the wind is over eight m/s the animals often keep still, waiting the wind to calm down. Hard wind makes that they cannot hear well, not smell well and they do not see well. All deer pay attention to wind but only few can use it. Those, who can use the wind move often downwind – especially at night – or sleep with wind at their backs. They can use their noses to control the wind coming behind and at the same time use their eyes to protect their front. Daytime the mature buck prefers to move "quartering downwind", scanning bigger areas with minimum of energy but the female deer, doe, moves in nose wind. (Wensel, 2009).

Michael Meuret and Fred Provenza's (editors, 2014) book *The Art & Science of Shepherding* is about one method: herding at rangelands. Rangelands are described as areas with natural high diverse vegetation (Hubert, Deverre & Meuret, 2004, 28), comparable to our biotopes. It investigates how French herders manage shepherding, how they plan the use of the pastures and how they design the daily circuit and how they lead their sheep during the day. When moving the sheep, the herder is measuring many indications the herd is giving for him while he is observing them (Lécrivain, Leroy, Savini & Deffontaines, 2014, 136). As his mission is to mainly fatten the lamb, he is moving them slowly to spare energy (Dureau & Bonnefond, 2014, 153). The herder has working dogs and with help of them he carefully leads the herd. Dogs are used for pushing, but even more as living barriers making the herd to turn or prevent them from turning (Savini, Landais, Thinon & Deffontaines, 2014, 102–103). *The Behaviour of Cattle* by Albright & Arave (2002) is a well-known book about cattle behaviour. The book tells how cattle sense

the world around them and how they learn. Also, how to handle cattle is discussed, how to do to keep the stress level low in both the human and the animals. Temple Grandin is one of the most famous names when talking about livestock handling. In her book *Human livestock handling* (2008) with Mark Deesing illustrates many practical advices how to handle animals. Not only telling how to do the book explains why animals do as they do. Is the reason genetic, learnt behavior or has it to do with the male dominance, the herd behavior, environment, build constructions or just an individual feature? One of the books named as additional reading in this book is Burt Smith's (1998) book *Moving 'Em. A Guide to Low Stress Animal Handling.* Smith has identified four methods when moving animals at the pasture: driving, herding, leading or physically transporting them. For him the driving meant to push animals from behind towards the place you wanted to move them. Essential here was, that as herding was done much from the same positioning, the way doing it was totally different. Pushing animals so they got in panic was a main method in driving as he describes it. When herding, you vary the pressure to the animals' flight zone by approaching them from different directions and using different speed and appearance. Leading the animals was the least stressful method for cattle moving. (Smith, 1998, 101-108.) It can be "following goodies" as bucket of concentrates, silage or hay or teaching the heard that when following, something better is to come as a new, fresh pasture (Smith, 1998, 240-245). The book includes as well as practical advice also a large appendix revealing the experiments he has done with cattle for example about flight distance.

One study: *Monitoring cattle behavior and pasture use with GPS and GIS* from Turner, Udal, Larson and Shearer (2000) described how they used a GPS tracker in this work. They were interested about the cows' location at the pasture and how the temperature influenced.

1.3 Purpose of the study

The purpose of this study was to identify and describe the general methods used when handling cattle and sheep in the biotopes in Finland.

Bringing these methods to awareness new farmers might to a greater extent start using the traditional rural biotopes as pastures for their animals. That would benefit the conservation of the habitats that are important for many different species. Having grazing animals around the rural landscape provides aesthetic value and wellbeing for humans as well.

This study was a commissioned work by Karjataidon tila. Karjataidon tila organizes herding courses and learn people handle cattle and sheep by using working dogs and horses. The main aim of this study was to describe observations from both 'good practices' and problems while managing livestock in Finnish biotopes for Karjataidon tila to improve their service products for Finnish farmers.

2 The research questions

The research questions were:

1. What kind of different methods are used for gathering and penning cattle and sheep at traditional rural biotopes in Finnish conditions?

2. How does the use of time and resources differ when using various methods?

In addition to these questions, the possible effect of wind on animal moving was also investigated.

3 Methods

I chose to use the mixed method approach where both qualitative and quantitative data was used (Creswell, 2003, 15–16). The data was collected using the sequential exploratory strategy (Figure 2.). I collected first the qualitative data with interviews and observations. In phase two I collected the quantitative data from the cows' movements in relation to wind and information about wind direction and speed.

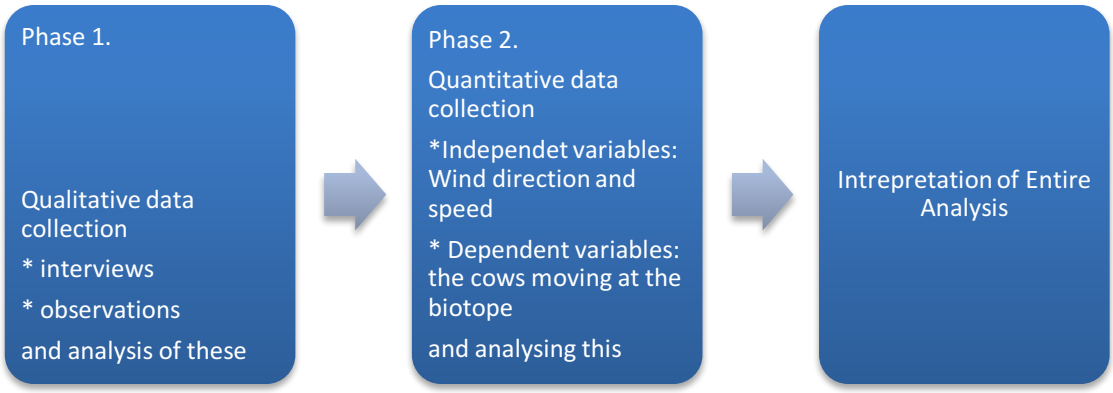

Figure 2. Mixed methods and sequental exploratory strategy and the order they are following each other in this study.

From the EU support payment data search service upheld by Agency of Rural Affairs (Mavi, 2014) I got a list with the names of the farmers who got support for managing traditional rural biotopes.

Because I wanted to get answers from farmers who had livestock and already 'the best practice' in use, I decided to contact those who had the biggest traditional rural biotope areas in Finland, assumed they had figured out systems that work. One limiting factor was that these traditional rural biotopes had to be located either in Southwest Finland or in Northern Ostrobothnia. This restriction came from the knowledge that the largest biotope areas in Finland were from these regions (Figure 1.). Exception from this was made with the interviews where some big biotope areas located in Ostrobothnia were also included in the study.

Interviews

25 interviews were carried out by phoning the farmers. Interviews were based on a form with six questions (Appendix A). The questions were about methods how farmers gathered animals, how many humans were involved, how much time it took and how the supervision of animals was managed during the summer. Questions about gates, water supply and corrals or pens were also included. Interviews were carried out as semiformal interviews (Kvale & Brinkman, 2014, 165–166). From the interviews a table (Appendix B) was designed. From that table the different methods were identified. Interviews were continued so long as new methods to gather animals at the biotope appeared, until the theoretical saturation was received (Esaiasson, Giljam, Oscarsson & Wänegrund, 2012, 275). The first interview was made 26.5.2016 and the last 29.6.2016.

Observations

Studying the object with one or many observations is a common way in qualitative research (Stake, 2000, 443). This study included in total eight observations. Three observations were done when the animals were inspected during regular visits in the biotope. Two of these observations included sheep, located in Southwest Finland and one cattle, located in Ostrobothnia. The priority was to see how the farmers were collecting their animals from the biotope. Even though the observations were a kind of their own, what was general was sought (Stake, 2000, 447). All in all, five observations were done in the autumn, when animals were collected back from the biotope. Different types of biotopes were included: seaside and riverside biotopes as well as whole islands. Two of the observations involved cattle and three sheep. The observations were made 4.7. –29.9.2016.

Observations I made at the biotopes started by choosing the places where to go. I made the choice trying to ensure the variety among sheep and cattle, type of biotopes and the location Southwest Finland – Ostrobothnia. The primary focus was to find farmers who had a lot to teach and who were willing to do so. (Stake, 2000, 451–452). The farmers I had picked up were called and possibilities for the fieldwork and its implementing was sorted out. One important and very practical question was when the farmer intended to collect the animals from the biotope. Because of the distance (up to 600 km) between localities in Northern Ostrobothnia and Southwest Finland good timing was needed. Especially the weather was a very important thing when planning the work at the islands.

While doing the observations, I concentrated on things that were crucial for the research questions. For example, how many humans were involved, how much time was used and what other resources were used. Each observation was increasing my understanding about the problems and solutions. (Stake, 2000, 443–448). The fieldwork was done by making notes, taking pictures and videos and using a stopwatch. (Creswell, 2003, 181; Esaisson, Gilljam, Oscarsson and Wänegrund, 2012, 304.) To register the movements of people and dogs on the site when they were gathering livestock I was in contact with one Finnish company named Ultracom Oy. They are manufacturing and selling GPS (Global Positioning System) -trackers for hunting dogs, reindeer and cattle. They lent me two dog-trackers DoGPSTX114 (Figure 3.) for this purpose. In each collar, there were two capsules: one for the batteries (4 x 1,2V AA) and one for the main GPS-transmitter. When I put the SIM-card in the GPS-transmitter capsule it was possible to load the following

Figure 3. One of the dog trackers used in this study from Ultracom Oy.

map software in my mobile and start using the dog tracker. All travelled routes were saved on the Internet. By giving the number of the order and my personal password I could afterwards recall all data from the observation. Four different displays were possible to choose: map views at the Google Earth, the general map or the terrain map from NLS

(National Land Survey of Finland), or data displayed in Excel. In each presented map, the travelled route was displayed. Depending on the settings the route was recorded at certain intervals. I chose the interval to be one minute. Afterwards, when reading the maps, it would have been better or more exact, if I had chosen the interval to be less than one minute. When something happens, one minute is a long time.

Wind study

The strategy of this inquiry was observational with a single subject design. Two variables were compared: the independent variable, that was wind, its direction and speed, and the dependent variable, that was the cow, how it was moving at the biotope. (Creswell, 2003, 164–171.)

I used a cattle tracker Karja-GPS (Figure 4.) that I borrowed from the same place (Ultracom Oy) where I borrowed the two dog trackers. This waterproof tracker had two 3,6 V batteries of AA- size that would have power for the whole summer. The SIM-card was installed inside the battery capsule at the factory.

Figure 4. Modell of the cattle tracker collar used for the cow.

The cattle tracker could be set to record the cows' location with wanted intervals. I decided to have four checking's per day. These times of the day were times when the cow was supposed to have both rest time (12 noon and 12 midnight) and grazing time (6 a.m. and 6 p.m.). The tracker was sending data over the Internet. From a map I could see exactly where the cow had been at those given times.

The Finnish Meteorological Institute did not give enough accurate information from the local weather at the site. I contacted a Finnish company named a-Lab Ltd. They lent me an a-Weather weather station (Figure 5.). The weather station was wireless and had a long-lasting battery so it was possible to place anywhere. It was sending data about air temperature, humidity, pressure, precipitation and the most important thing in my study: wind speed and direction. Information of the wind was collected with a three-cup anemometer. The weather station was sending data every fifteen minutes to a database on

the Internet using the GSM-network. The data was available in diagrams and in Excel tables.

Figure 5. The weather station from the a-Lab on the site.

The weather station was placed 900 meters from the biotope and positioned at 1.6 meters. Wind directions can be presented in general by the compass. Cardinal points of the compass are north, east, south and west and inter-cardinal points northeast, southeast, southwest and northwest. When exact wind direction is needed, azimuth circle with degrees $000^{o}/360^{o}$ is used. (Integrated Publishing Inc. w.y.a) The weather station used in this study was showing wind directions as degrees on the printouts. The compass that is showing wind conditions on polar coordinates is called wind rose (Ashford, Mumyiz & Wright, 2011, 307).

Wind direction is the direction from where the wind blows (Intergrated Publishing Inc., w.y.b, Roth, 1977, 112). For example, wind 180^{o} means that it is blowing from the south. Figure 6a. is showing four cardinal points of the compass and azimuth bearings.

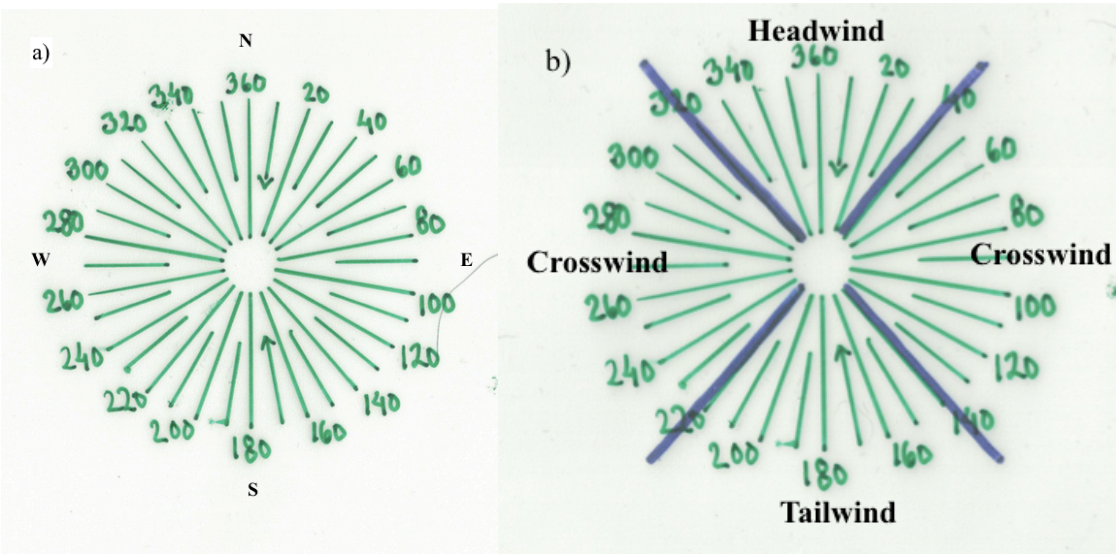

Figure 6a. A wind rose with cardinal points of the compass and azimuth degrees. 6b. Dealing the wind rose for headwind, crosswind and tailwind in this study.

I made two transparent pictures of wind roses on plastic sheets. One picture was with degrees (Figure 6a.) and the other was divided to headwind (100^0 of the wind roses' totally 360^0), tailwind (100^0) and crosswind (totally 160^0) (Figure 6b.).

The International Virtual Aviation Organization (IVAO, w.y.) is giving following definitions for pure headwind, tailwind and crosswind at one of theirs training documents and these are the meanings which are used in this study:

> "Headwind = the direction of travel is opposite direction of the wind.
> Tailwind = the direction of travel is the same direction of the wind.
> Crosswind = the direction of travel is perpendicular to the wind direction. It can be from left to right or from right to left."

For comparing the wind directions with the movements of the cow I printed out the map from the tracker program every day. I drew a line between each point on the map, from 12 midnight to 6 a.m., from 6 a.m. to 12 noon and so on (Figure 7.). When estimating

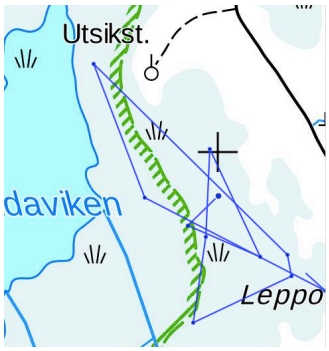

Figure 7. The cow's movements on the map. A dot is showing her exact location at a certain time.

direction of the movement I put the picture showing degrees on the movement line on the map (both the picture and the map pointing true north). Degrees of her movement was read from the wind rose in the direction of her movement. I compared the movements of the cow and wind directions in six hours´ pieces. Every fifteen minutes I estimated if the cow had been moving in cross wind, head wind or tail wind. I wrote that information in the worksheet (Table 1.).

Table 1. An example of the daily bookkeeping how the cow's movements were recorded.

Day	Paper	Time	Headwind	Tailwind	Crosswind
8.8.16	A	12.00-18.00	11	7	2
8.8.16	A	18.00-00.00	4	18	2

The data was collected between 8.8. – 30.8.2016. When the wind speed was 0,0 m/s no data for wind direction was written. When all the data was written in the table I added up separately every row. The total sums of headwind, tailwind and crosswind were counted as well as percentages. A χ^2-test was used to analyze if the cow moved in a random way in relation to wind direction or not.

The ethical approach

An ethical approach is a very important component in qualitative enquiry. Sensitive information about the persons or their farm may be exposed (Creswell, 2003, 201–202). In this study the identity of the interviewed persons was hidden by using numbers instead of names when making tables (Kvale & Brinkman, 2014, 228). Location of the traditional rural biotopes where observations were made, were not revealed to maintain privacy. The involved persons had a possibility to follow how the research was proceeding from a blog at the Internet (www.cattlebiotopes.blogspot.fi). The farmers participating in the case studies received if they wanted the photos and videos that were chosen and might be used in public. The farmers had the possibility to comment or forbid the use of them.

When doing the quantitative experiment with the cow and her movements, the owner of the cow wanted me to ask the county head veterinarians opinion if he would give his approval for having a collar on a cow while being in a biotope. I contacted the veterinarian and he did not see any negative in the experiment and because of that the experiment was put into action.

4 Results

4.1 Interviews

Totally 25 interviews were made. 14 of them were made in the Southwest Finland region and eleven in North Ostrobothnia or Ostrobothnia region (Table 2.). Of these farmers 18 had cattle and 14 sheep. Seven farmers had only cattle in Southwest Finland and three in Northern Ostrobothnia or Ostrobothnia region. Three farmers had only sheep in Southwest Finland and four in Northern Ostrobothnia or Ostrobothnia region. Of these farmers seven had both species, four of them living at Southwest Finland and three of them at Northern Ostrobothnia or Ostrobothnia region.

Two farms having both sheep and cattle one of the species were not analyzed because of the inaccuracy of the answers.

Table 2. Farmers interviewed, having sheep, cattle or both.

Region	Sheep	Cattle	Both
Southwest Finland	3	7	4
Ostrobothnia, Northern Ostrobothnia	4	4	3

4.1.1 Cattle

There were two main differences in circumstances when managing the cattle. Those who could have the cattle walk to the cow house from the traditional rural biotope by themselves (they were six, five of them from Southwest Finland) and those who could not. They were 13, and they used a corral, trailer or transport boat when gathering and transporting cattle back home.

Pulling

Those who were gathering the cattle first in a corral, trailer of in a ferryboat were using pulling method in nine cases. Pulling was done with feed. When the feed was a concentrate or flour, some teaching was always included. The cattle were learnt to come to some place by feeding them there or they were learnt to come when called and to follow that person who was calling. Teaching the cattle was done at the same time when checking them. In six cases the feeding was only a short time happening, lasting one week or only a few days before the animals were gathered from the biotope. In one case pulling with feed (concentrate) was the only method for gathering the animals in a corral. It was a ‘one man

system' where animals where kept tame by visiting them two-three times a week, always gathering them and moving them with the help of feed.

Five farmers were using silage or hay bales when pulling the animals from the traditional rural biotopes. Three of them were feeding the animals a short time before catching them and two were using the silage bale only when gathering them for transport. All of them reported, that lack of the grass was a key for success. Four farmers of thirteen did not report for using any pulling method for gathering the cattle.

When the cattle could walk home by themselves, no food was used for pulling them. Two farms of six were pulling the animals by calling them.

Pushing, cattle in corrals, pens, trailers or ferryboats

Pushing was the most common method when gathering cattle in this study. All but the one farmer described above used some pushing. It was mostly a combination with pulling with food and pushing with something else (eight of twelve). That was humans in all twelve cases, lack of grass in seven cases, quad bikes, jeeps, tractors or motocross bikes in four cases and working dogs in one case. Persons involved varied from two to six. Motor vehicles were used in three cases in Ostrobothnia or Northern Ostrobothnia region and only in one farm in Southwest Finland.

Those who used only pushing as the gathering method were four. All four combined two or more pushing elements. It was men and quad bikes, men and working dogs, men and lack of grass and men, quad bikes and lack of grass. When men and lack of grass where the tools used for pushing, teaching (or managing) the cattle during the summer was included in two cases. The biotope in these cases was divided in several blocks or there were several, smaller biotopes. These were grazed until the grass was running out and the cattle was moved to a new block several times under the summer. One farmer was practicing changing feeding blocks but also pulling the animals when gathered with food. All these three farms who were using blocks were in Southwest Finland. There was only one farm in this study using working dogs with cattle. In this farm two or four dogs and three humans were the pushing elements, no other method was used. This was also the only farm where no teaching of the cattle was done during the summer.

Pushing, cattle walking home by themselves

When cattle were close to the cow house and they could walk home, by far the most common method was pushing them with lack of grass. Five out of six reported they were moving cattle this way. Two of these had also humans (from one to four) pushing the animals. One of the interviewees told: "The cattle were so eager to come home so they just

had to open the gate and the animals were running home all the way". When taking them home along the road two men were helping to open and shutting the gates. Animals were taken home between September and November. In four cases the cattle were moved first from the biotope to a field nearby. When that pasture was eaten empty they were moved to the next pasture and so one until the animals were at home. Moving the cattle was done only by opening the gates. The cattle went to the new pasture on their own time. One farmer was also giving goodies for animals while checking them.

Teaching

Teaching methods were: using the same person or vehicle (six times), feeding animals a short time or more regularly (seven times), chancing blocks (three times) and giving goodies and making the mob to move (four times).

Using the same person to handle the cattle was combined five times to other teaching methods. As only teaching method it was reported from a farm where the cattle was gathered using quad bikes, but no pulling method was used. The same quad bikes were used when checking the cattle so they knew the sound of these quad bikes. In three cases the person was also giving the cattle goodies and moving them when checking. All these three farms were using concentrated food as pulling method. In two cases the same person was letting cattle for new fresh grass when needed.

Using the resources in different methods

Time used for gathering the animals differed a lot from farm to farm. One farm had several islands to take care of and making them all empty took one week. One other farm had divided the traditional rural biotope in blocks and were collecting their cattle from an area of five hectares. When looking only for used time and different methods, those farms (n=3) who used only pushing method were faster than those using pulling (n=1) or both pulling and pushing (n=8) method (Table 3.). The standard deviation reveals that there were big differences among the farms using the same method. Using mixed methods was the most common way to gather animals. In average, it took 19 hours (over two working days) but also here the standard deviation (13 hours) reveals that there were big differences among these farms (Table 3.).

Table 3. Average time and standard deviation (hours) when using different methods gathering cattle.

Working time when gathering animals, hours			
	pushing (n=3)	pulling (n=1)	pushing and pulling (n=8)
average	3	8	19
standard deviation	4	-	13

The size of the traditional rural biotopes in average seemed quite equal in all groups (Table 4.) but even here there were big differences within the same method.

Table 4. Average size of the traditional rural biotopes and standard deviation within different methods.

Size of the biotope, hectares			
	pushing (n=3)	pulling (n=1)	pushing and pulling (n=8)
average	70	50	68
standard deviation	69	-	69

Different tools used for gathering animals were humans, dogs or vehicles. Dogs were used only in one farm but half of the interviewed farms reported that vehicles were used. When comparing methods, the farmer (number 23 in the figure 8.) who used only pulling method when gathering the cattle needed less resources. Farm number 20 (Figure 8.) had two men with quadbikes pushing the animals. Three of those who had mixed method (both pulling and pushing) were using more recourses than anybody else.

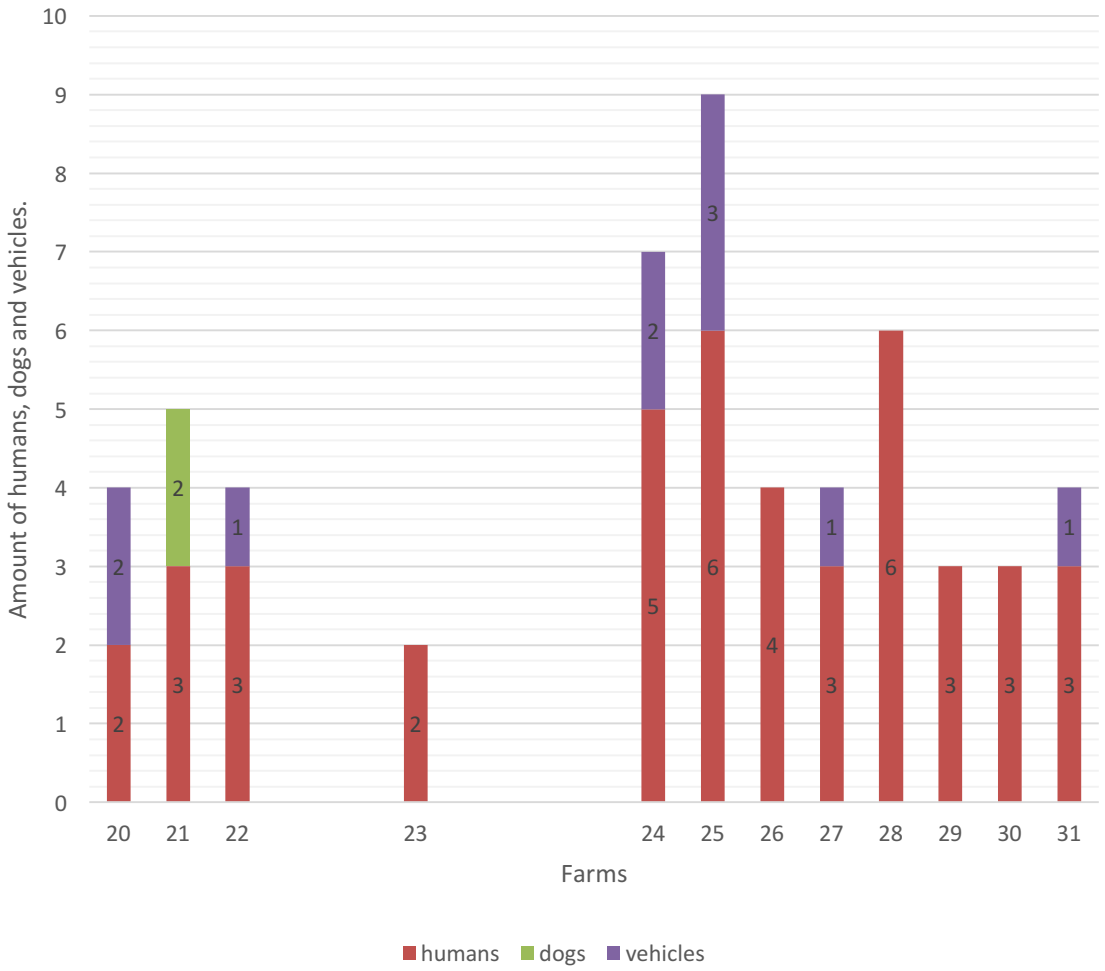

Figure 8. Cattle farms with different gathering methods (20-22 pushing, 23 pulling and 24-31 using both) and amount of used resources.

Size of the traditional rural biotopes and number of animals there can affect the working time and how many humans or other tools are used. The recommended average grazing pressure for seaside meadows is 0,4 – 1,0 cow (with a calf) per hectare, depending on the vegetation (Niemelä, Pessa, Hägg, Timonen & Huuskonen, 2006, 139-140). Figure 9 is showing the average tale of cattle per hectare in different farms and different methods. Farms number 21 and 23 had less animals per hectare (0,2 animals per hectare) and farms 26 and 27 had the highest cattle density from 4,8 to 5 animals per hectare. When having animals widely the method could be any. The number of cattle per hectare in the traditional rural biotope did not steer what method was used. But when the number of animals per hectare was rising the farmers were using more a combination of both pulling and pushing methods (Figure 9).

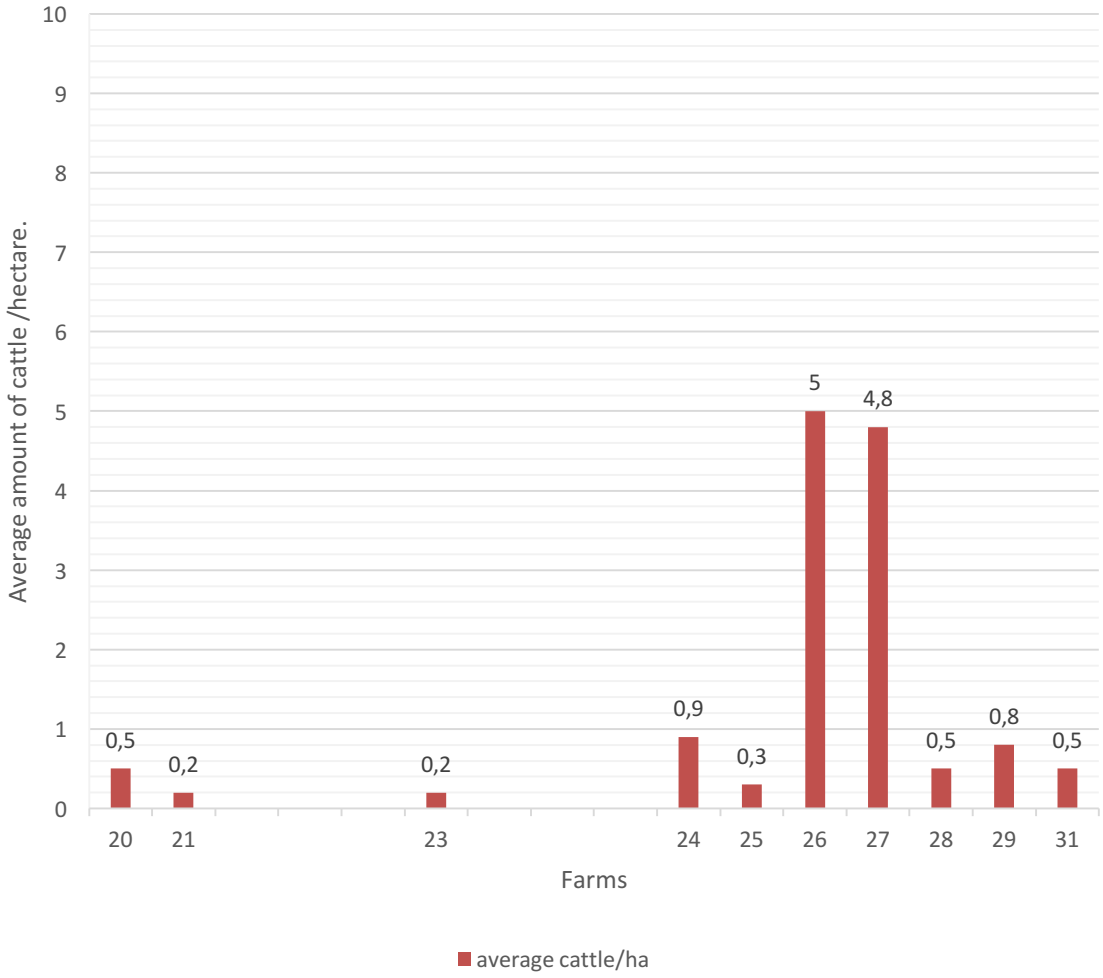

Figure 9. Interviewed cattle farms with different gathering methods (20-21 pushing, 23 pulling and 24-31 using both), average amount of cattle/ hectare.

4.1.2 Sheep

All the fourteen interviewees reported that they had to collect the sheep before moving them from the biotope. Nobody had the sheep to walk home by themselves. Some farmers had to pen the sheep first before driving them home but others loaded the sheep directly in the trailer or on the ferryboat.

Pulling

Nine farmers used food for pulling the sheep. At five cases pulling with food was combined with calling the sheep. Food that was used was oats in a bucket at six farms. Bread was used at two farms. Five of the interviewees did not use any pulling but only pushing.

Pushing

All sheep farmers were using some pushing. When compared with the cattle farmers the sheep farmers were mostly using only one tool for pushing. It was (in five cases) humans or dogs (also in five cases). Two of the farmers told that the only pushing tool they used for collecting the sheep was lack of grass. They were also pulling the sheep with feed. Only one farmer combined two tools for pushing: humans and dogs. All except one of those farms where humans were pushing used feed for pulling. One of those who used working dogs also used humans for pushing, the rest of dog users did not have any other pushing tool in use. Two of the dog users also used the pull-method with feed.

Teaching

Teaching the sheep was done when checking the animals. In three interviews it was pointed out that the herd was always managed by one, same person. He or she was the one who always did the checking, moved the sheep while checking them and gave them goodies. When calling was one of the pulling tools, teaching was always done with feed. Bread or oats were used as reward. Eight farmers did move the herd while checking them. The reason to move the herd was to observe that all sheep were healthy and were moving normally. In some cases the farmer also pointed out that he was teaching the sheep to come to the collecting place or coming when called.

Sheep farmers had many different solutions when monitoring, checking and managing sheep. Some of them used GPS-trackers. One of the interviewed had a tracker put around the neck of the sheep that was in a leader position. Another farmer had put three GPS trackers to sheep in the same herd. They could follow the sheep (and the herd) from home through the Internet every day. One farmer used a dog-tracker when searching for the sheep. He sent his dog (with the tracker) searching the sheep and followed from the map on the mobile phone how the dog was moving. When the tracker showed that the dog was standing still the farmer knew that it was there where the sheep were.

One farmer counted the sheep using two working dogs. With one of the dogs she separated a small number of sheep from the bigger herd – those she could count. Then she repeated this process until the whole herd was counted. The other dog helped to keep the herd together while counting. Another farmer took a picture of the herd, enlarged it when back home and counted the sheep from that picture. One farmer had different colors of sheep so he knew when he saw them about in what proportion they should be.

Using resources in different methods

Working time was in average quite the same no matter what method was used (Table 5.). Anyhow, from farm to farm there were big differences. For example, the fastest farm was number 7, that was using only 30 minutes for collecting the sheep. For farm number 3 it took one whole working day. When building helping fences, farm number 7 had 155 meters' fences but farm number 3 did not need any. Those who used pushing and pulling method had in average 7 % larger biotopes than those who used only pushing method (Table 6.). The standard deviation reveals also here that there were big differences among farms. The difference between two farms who both used pushing was 150 hectares.

Table 5. Average time and standard deviation (hours) when using different methods gathering sheep.

Working time when gathering sheep, hours		
	pushing (n=4)	pushing and pulling (n=7)
average	8	9
standard deviation	11	9

Table 6. Average size of the traditional rural biotopes and standard deviation within different methods.

Size of the biotope/hectares		
	pushing (n=3)	pushing and pulling (n=2)
average	105	121
standard deviation	82	9

All those farms who used pushing method also used working dogs (Figure 10.). In average these farms had 2,5 humans involved to the job and those who used pulling and pushing method had in average 3,4 humans doing the job.

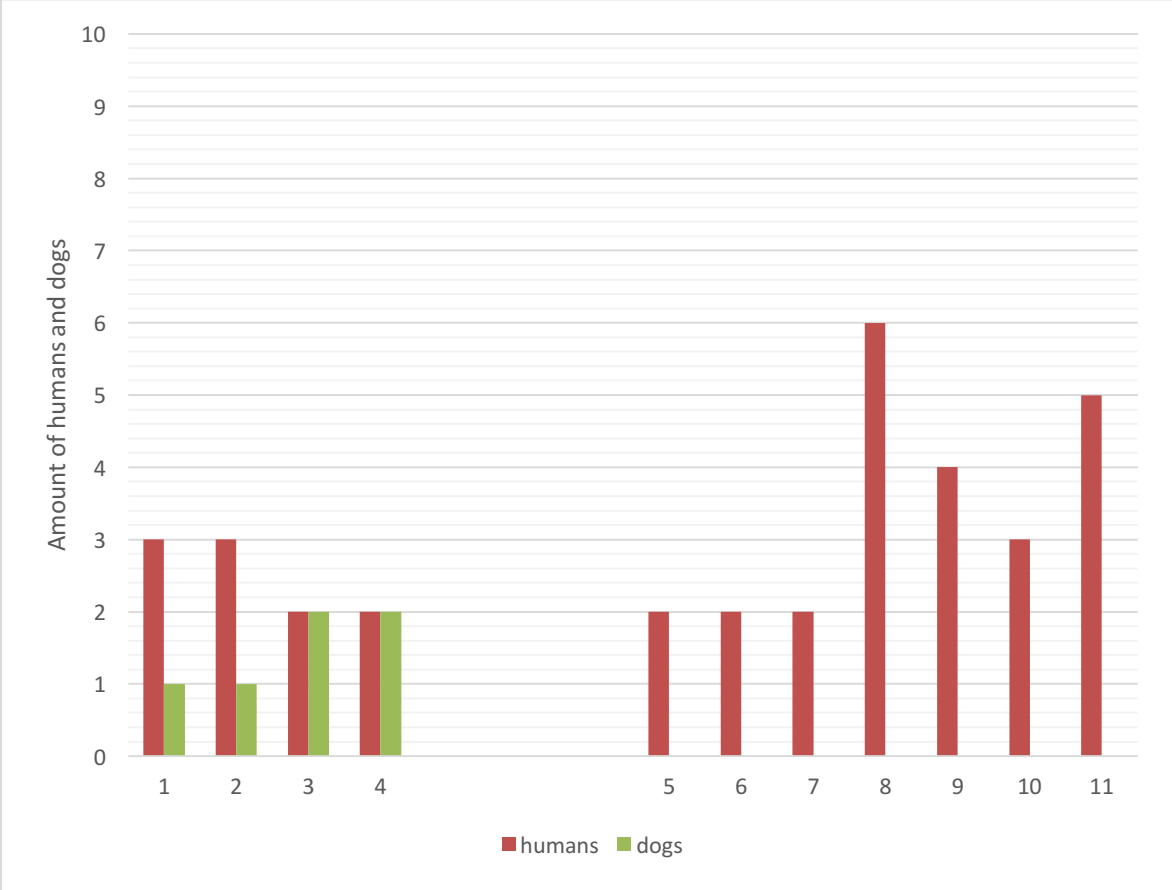

Figure 10. Sheep farms using different methods (1-4 only pushing, 5-11 pushing and pulling) and resources.

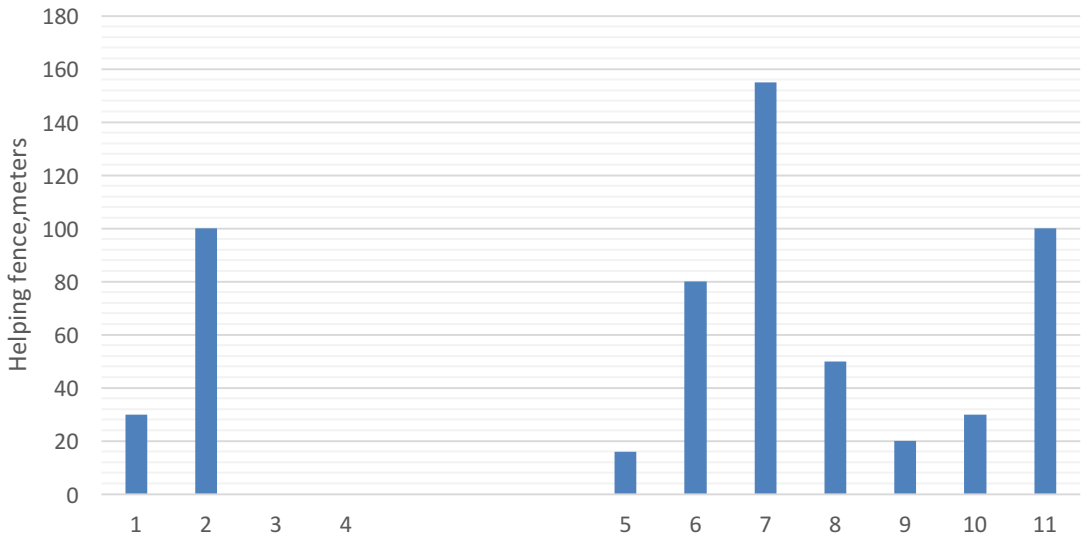

Figure 11. Fences in meters that were built when gathering sheep and using different methods (1-4 only pushing, 5-11 pushing and pulling).

4.2 Observations

In total eight observations were included in this study. Half of them were in Ostrobothnia and half of them in Southwest Finland. Both sheep and cows were well represented. The first five observations were done in the autumn, when biotopes were made empty. Two of the observations included cattle and three sheep. One of the cattle farmers was using both pulling and pushing methods and the other one only pushing. Sheep farmers were using only pushing method with different tools.

Three observations were made when the farmers were checking the animals. While doing the checking the farmer was looking that the animals were fine. They also made observations about the grass, water, salt and how fencing was working. Two of these observations involved sheep and one cattle.

4.2.1 Sheep in riverside meadows

This observation was about taking ewes (42) and rams (13) away from the traditional rural biotope in autumn. There were two separate blocks, both riverside meadows. The first one, where the ewes were, was 12 hectares and the second one where the rams were, was 5,8 hectares. The method was pushing with the help of a working dog. Workers participating were one: the farmer alone. Using gates or other material carried on the biotope: no.

Figure 12. Transporting the sheep between the fields from the biotope to the trailer along the farm trail.

Animals were transported with a car and a horse trailer. The farmer chose to gather the ewes first because it would be easier to load the rams in the trailer, when it had smell from the ewes inside. The trailer managed only half of the number of ewes so the farmer had to gather and bring the herd two different times. There was no road but a farm track leading to the biotope (Figure 12.). It was sloping towards the river and muddy so it was not possible to drive there with the car and the trailer. The trailer had to be left about 300 meters away at a parking lot. The parking lot belonged to the owner of the biotope and was mainly intended for guests to the farmhouse. The biotope was mainly meadow with groups of trees and bushes. In some places the terrain was quite steeply sloping and the herder was walking only on the upper part of the area while the dog was sent to examine the riverside more closely, at times 100-160 meters away from the owner (Figure 13.). Both the farmer and the dog carried dog trackers (Figure 14.). The dog was walking almost double the distance the farmer did. Maximum speed for the dog while searching was 18 km/h, but when pushing the sheep, it was 5,4 km/h. Average speed for the dog was 6,9 km/h. Average walking speed for the farmer was 1,1 km/h. (Table 7.).

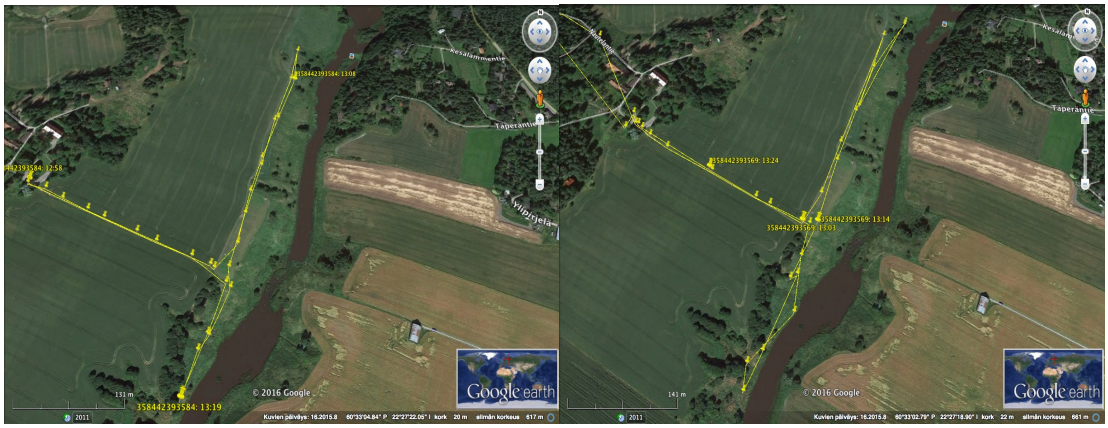

Figure 13. Two pictures showing the farmer's and the dog's movements when taking the rest of the herd away from the biotope.

Figure 14. Distance between the dog and the farmer could be over 100 meters. Notice that the dog tracker was used for peoples as well in this study.

When the herd was found, the dog brought the sheep in one group to the farmer. Then they started to walk to the gate. First sheep, then the dog pushing the animals and the farmer last, giving commands for the dog (Figure 15.). Before reaching the gate, the farmer divided the herd in two parts. It was because only half of the herd had place in the trailer. The dividing was made by calling the dog to run through the herd and then keeping the two parts separate. Concentrating to push the first herd with the dog the farmer was walking to

Figure 15. The dog was controlling the sheep from the side so the sheep can see the dog. The dog used the tracker.

the gate. She opened all the three electric fences and used the dog to push the sheep to the farm trail. The other herd that had been left to the biotope was following to the gate at a distance. When the first herd was about 60 meters away walking along the farm trail two sheep come through the gate and tried to join to the first group. The farmer made these two sheep stop before they reached the first herd. She called the dog for help. The first herd kept standing nicely still meanwhile the dog and the farmer showed the runaways a way back to the biotope. The sheep walked through the electric gate as they did before. But now they accepted to be left and did not have a desire to run after the first mob. After this incident transporting the first herd to the trailer continues evenly.

Figure 16. Loading the sheep in the trailer with the dog. No fence elements were used.

A lot of cars at the parking lot revealed that some sort of celebration was going on at the farmhouse. The trailer was parked so that it was not in a way for the guests of the farmhouse and the possible sheep manure droppings would cause minimum of harm. The car was parked so that all the wheels were on sand, not on slippery mud or wet leaves. When putting the sheep in the trailer no gates or other helping equipment's were used (Figure 16.). This was a plan from the farmer who wanted to minimize all portable extra staff. While the farmer packed the first sheep in the end of the trailer, one last sheep made a little fuss. It jumped out of the trailer and made a couple of roundabouts around the trailer. However, the dog was alert and kept the sheep under control until the farmer came

and helped the dog to get that sheep inside. Taking the first herd from the biotope in to the trailer took 38 minutes (Table 7.).

When taking rest of the herd from the same biotope the routines were similar. The car and the trailer were parked at the same place as the first time. The remaining herd included 21 ewes. Loading the sheep in the trailer went fluently. Catching and transporting the rest of the herd and making that block empty took 35 minutes. (Table 7.).

The third block was a part of this riverside biotope wholeness. It was 5,8 hectares and there were 13 rams grazing. The terrain was similar as on the previous block but it included more forest. The car was parked this time in front of an outbuilding with good space around. It was parked downhill to make the start easier. The farm trail was 204 meters long. When searching for the sheep at the biotope the farmer walked 455 meters and the dog 652 meters. Speed of the herder was in average 0,9 km/h, and for the dog 5,9 km/h. Making this 5,8-hectare biotope empty took 18 minutes (Table 7.).

Table 7. Collected data from the observations.

1. First observation	**Hectares**	**Meters**	**Minutes**	**Pieces**	**Average km/h**
Biotope, hectares	12				
Sheep, how many				21	
Humans				1	
Dogs				1	
Walking along the farm trail, before		317	7		
Walking along the farm trail, after		317	4		
Farmer, walking in the biotope		886			1,1
Dog, running in the biotope		1575			6,1
Making the trailer ready			5		
Opening and closing the gate			2		
Searching and bringing the sheep			18		
Putting the sheep in the trailer			2		
Sum minutes			*38*		
2. Second observation	**Hectares**	**Meters**	**Minutes**	**Pieces**	**Average km/h**
Biotope, hectares	12				
Sheep, how many				21	
Humans				1	
Dogs				1	
Walking along the farm trail, before		317	5		
Walking along the farm trail, after		317	5		
Farmer, walking in the biotope		1171			1,5
Dog, running in the biotope		1625			6,3
Making the trailer ready			1		
Opening and closing the gate			1		
Searching and bringing the sheep			20		
Putting the sheep in the trailer			3		
Sum minutes			*35*		

3. Third observation	Hectares	Meters	Minutes	Pieces	Average km/h
Biotope, hectares	5,8				
Sheep, how many				13	
Humans				1	
Dogs				1	
Walking along the farm trail, before		204	3		
Walking along the farm trail, after		204	3		
Farmer, walking in the biotope		455			0,9
Dog, running in the biotope		652			5,9
Making the trailer ready			1		
Searching and bringing the sheep			8		
Putting the sheep in the trailer			3		
Sum minutes			*18*		

4.2.2 Limousine cattle in seaside biotope

This observation was made in the autumn when all cattle was taken away from this 50-hectare big seaside biotope (Figure 17.). The method was a combination of pulling and pushing. Pulling was done with a help of food. Pushing was done with humans. Workers participating in the job were three: two active where one was driving the tractor and one was walking and giving goodies when pulling the cattle from the biotope and one passive who was standing mostly on the opposite side of the corral. Using gates or other material carried on the biotope: 23 metal separate fence elements. Transporting animals was done with a tractor and a cattle trailer.

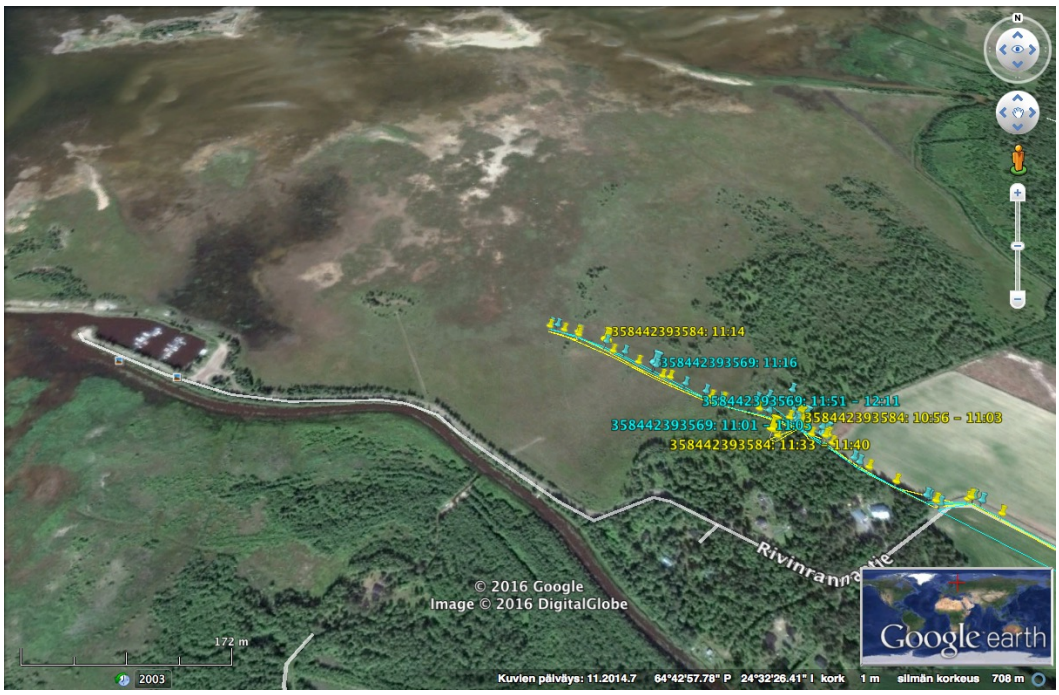

Figure 17. A satellite picture is showing the biotope area and tracks of the GPS while pulling cattle.

The farmer told that he tried to take these animals away from the biotope already two weeks ago, but they did not come. “There were still too much to eat at the biotope”. This was a new try. The biotope area was a seaside meadow, most of it was reed. The size of the area varied depending how high the seawater level was. At the biotope were 25 cows, their calves and one bull. The day before the farmer and his worker had transported 23 metal fence elements and made the old wooden corral more secure. 16 fence elements were used for making the main circle and seven elements for separating half of it (Figure 18.). These parts

Figure 18. The corral was divided in two parts. The first coming cows were closed in the first section with feed (left).

could be shut from each other with a fence element. The corral had two permanent gates with hinges. One gate from through which the animals came into the corral and another that led to a small loading area. That gate opened if needed 180 grades. Transporting the 23 elements and making that corral ready took six hours for two people. Mainly because of the lot of rain the ground around the corral was muddy. The farmer had brought a straw bale some days before into the inner circle of the corral. He had left all the gates open and when we came to the site, it was obvious that some of the cows had already been examining the corral. When starting to gather the cattle, the farmer took the tractor and a bale of silage.

First he took the plastic away from the bale (Figure 19.). The net was left around it to keep the bale whole all the way to the biotope and back to the corral again. Because if the bale got broken during driving at the biotope, the cattle would stop moving and instead start eating the bale.

Figure 19. Plastic was taken away but the net left around the bale while luring the animals and driving with the bale. Some feed is taken in a bucket.

The workman took a bucket with goodies (Figure 19.). Meanwhile the farmer worked with the tractor and the bale cows at the biotope heard the tractor motor sound and started to moo. The farmer and the workman started to drive with the tractor into the biotope. After driving 300 meters the cattle came towards them. The worker jumped out of the tractor and started to walk back again. While walking, he put some feed here and there on the ground. The farmer drove backwards back to the corral. Some cows followed the worker and were first in the corral. They came into the inner circle and the worker continued feeding them there. The third helper kept her place on the side of the corral gate preventing the cattle to go around the corral. The farmer backed with the bale in the inner part of the corral and dropped the bale into a ring feeder. At the same time about half of the cows and calves started to hesitate and run ca. 50 meters away. As some cows from the inner circle tried to follow, the gate between these two parts was closed. The bull and about 10 cows were still inside. When this happened, the farmer gave order for everybody to back off. The worker went to the opposite side of the gate where the farmer was. Everybody were just waiting (Figure 20.). The runaway mob with many calves were standing, looking unsure where to go and mooing and so did the cows inside the corral. After a while the runaways came closer. The farmer and the worker started to put some goodies close to the gate. Little by little the cows started to come back.

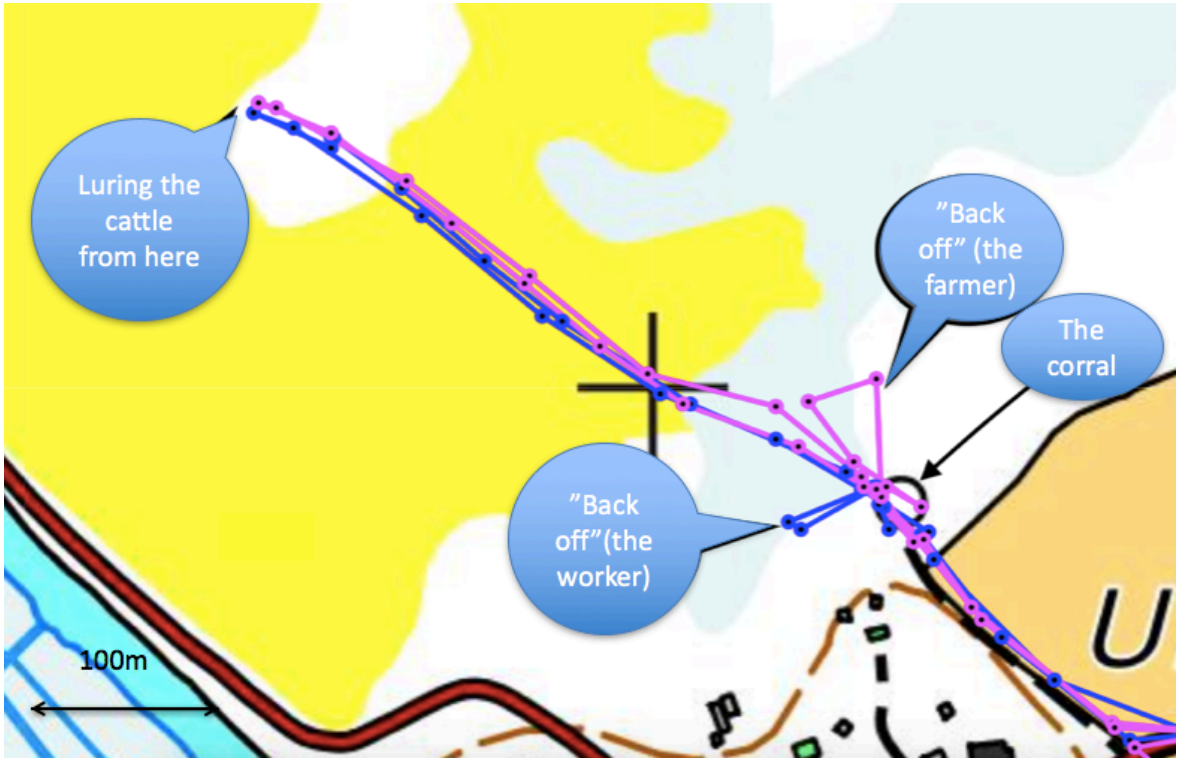

Figure 20. Movements of the farmer and the worker while gathering and penning cattle.

When all the runaways were around the gate, all three persons started to walk slowly closer to the cows and in that way, push them in the corral. One calf was a little bit tricky but about 20 minutes later all the animals were inside and the gate was shut.

It can be pointed, that while handling the cattle all the time all movements were calm. No rushing, shouting or hesitated movements. Movements at the biotope were in average 0,6 km/h (Table 8.). The third helper was standing ca. 30 meters from the corral gate and attended when rest of the mob were to be pushed in the corral.

Another farmer did the transporting of the cattle with his trailer. When he came, all three men went inside the corral among the cattle and with a help of the turning gate pushed some cows in the loading area (Figure 17.). The trailer had two parts. When the first animals – about five – were in the trailer the solid gate between these parts was closed. The trailer had a ramp along which animals walked into the trailer. The first five cows walked into the trailer easily. The other group moved into the loading area included also calves. Some of them got panic and just run no matter if there was a fence in front of them or not. They were let back in the corral side because apparently, their mothers were still there. When the other group was almost nicely up, the first cow in the group turned around and all came back down. With some pushing the three men got all animals into the trailer and the gate could be closed. It took 827 minutes to take these animals from the biotope (Table 8.).

Figure 17. Three men pushing cattle into the trailer.

Table 8. Collected data when taking cattle home from this biotope.

Observation	Hectares	Meters	Minutes	Pieces	Average km/h
Biotope, hectares	50				
Cattle, how many				51	
Humans				3	
Fence, meters		69			
Making the corral ready, transporting the elements from home to the site, 7 km.			360*		
Taking the silage bale, goodies, discussing the plan with all helpers			13		
Moving from corral to the biotope		387	6		0,7
Moving back to corral		387	10		0,5
Penning the cattle			25		
Taking the net away from the bale, checking the corral, inspecting animals			26		
Packing the cattle into the trailer 9min.*3			27		
Unpicking the corral and bringing the elements home, 7 km.			360*		
Sum minutes			*827*		

* Information from the farmer.

4.2.3 Sheep in seaside biotope

This was a 28-hectare seaside biotope where sheep had been grazing every summer already eight years. When this observation was done, there were 113 sheep. It was autumn and the biotope did not support the animals anymore. Therefore, the farmer had decided to take all sheep away from the biotope. The method used was pushing with a help of a working dog

and men. Workers participating in the job were three. One man with the dog and the farmer and his worker helped when penning and loading the sheep into the trailer. The worker and the farmer did build the pen and removed it after use. Using gates or other material carried into the biotope: 33 metal separate fence elements for sheep. Animals were transported with a tractor and a transport trailer (old trailer belonging to a slaughter car) (Figure 18.) and a car and a self-made trailer.

Figure 18. A trailer made from a slaughter lorry.

When arriving to the site, the farmer first checked the biotope to locate where the sheep were. Because of the low vegetation it was easy to see where they were. Then they started to build the pen. All the elements (33) where used when building the pen. It was placed in a corner, as close to the road as possible. The pen was like a funnel; the bigger part was inside the permanent fence (neat) and had a wide opening. Then it became smaller leading to a bridge along which the sheep could walk in the trailer. It took one hour to build the penning system. All the fences of special importance – for example in corners, were secured with lockable straps. When the pen was ready and the helping farmer with his dog had arrived, gathering of the sheep started. The farmer and his worker positioned themselves strategically so they could help with penning. The man with the dog knew where the sheep were so he did not have to search the mob. He started to go in the direction where the sheep were, the dog with him. When ca. 60 meters away from the mob, the dog was sent to gather the sheep and bring them. After that the dog and his owner were pushing the sheep together towards the penning system 1200 meters (Figure 19.).

Figure 19. The man and the dog are both pushing.

When they were quite close to the corner (where the pen was located) some sheep tried to run into the bushes nearby, but the dog brought them back. When the sheep were inside the penning area, the farmer and his worker joined to the work and pulled fence netting behind the sheep so they were pushed inside the pen that was made of metal fences.

Figure 20. Making the pen smaller and smaller before starting to load the sheep in the trailer.

When the sheep were inside the pen, one sheep was still running and searching for the rest of the mob. It was interesting, that though the lonely sheep was bleating no one from the big mob answered. Instead of trying to push the lonely sheep the worker tried to pull it to the mob and was imitating the *baa* – sound. It worked and when all the sheep were inside the pen it was closed properly. The farmer with the dog told that there was still one sick lamb on the site, so they had to go and search for it. When they found the ewe, it was very tired and had problems to walk. The men carried it on stretchers (one metal fence) where the other sheep were. Then the sheep were pushed closer the funnel that led to the trailer. It was done by making the pen smaller by moving the fences (Figure 20.). Inside the trailer was put new, light cutter shavings. All three persons and the dog were located on the opposite side of the trailer to make a push effect. Anyhow, they did not do any movements, no sound or anything to make the sheep scary. The mob did not move and the worker jumped over the fence to the same side where the sheep were. He picked up one sheep and pushed it almost into the trailer. While the sheep was still on the upper end of the bridge, he jumped out of the way, on the other side of the fence again. When the other sheep saw this way out of the pen they quickly started to climb after the first sheep. At the same time the farmer and the others made the penning area even smaller by moving the fences. The sheep were moving without any more help into the trailer (Figure 21.).

Figure 21. The sheep were flowing in to the trailer without further assistance.

When the trailer was full, the rest of the sheep were left in the pen. The tractor and the trailer were moved aside and the car and the smaller trailer were placed instead. Loading sheep inside the smaller trailer was done following the same procedure. First all push-

effect was made behind the trailer but without any fuss. When the sheep did not move by themselves inside the trailer, the farmer lifted one of the sheep inside and backed off. Pushing was now made strongly by moving fast beside the moving mob 'up the stream'. The last sheep was pushed inside the trailer by hand. When both trailers were loaded, there was still a job to do: to remove the pen. It took 207 minutes to gather the sheep from this biotope (Table 9.).

Table 9. Collected data when gathering sheep from this seaside biotope.

Observation	Hectares	Meters	Minutes	Pieces	Average km/h
Biotope, hectares	28				
Sheep, how many				113	
Humans				3	
Dogs				1	
Fence, meters		66			
Making the pen ready			60		
Bringing the sheep			42		
Farmer, walking in the biotope		1264			0,7
Dog, running in the biotope		1412			2,3
Bringing the sick sheep			20		
Loading the sheep in the big trailer			7		
Moving vehicles			15		
Loading sheep in the smaller trailer			3		
Removing the pen			60		
Sum minutes			*207*		

4.2.4 Sheep on islands

These observations were about collecting sheep away from three islands in the autumn. The first island was 30 hectares, the second 8 hectares and the third 16 hectares (Figure 22.). The method used was pushing. Workers participating: in the first and the second island pushing was done with the help of three men and a dog, but the dog was on a leash and had a passive roll with his owner. The third island was managed by two men and it is from there the most complete data is collected. While the main method was pushing the animals, the sheep that were already in the boat when arriving to islands number two and three could have had some pulling effect. In the morning, the boat was loaded with 14 pieces light metallic separate sheep fences and two wooden fences. It was not a coincidence that the weather was perfect that day. The farmer had been following the weather forecast, wind, height of sea level and waves for weeks. When the weather was

good enough, the trip was done. The farmer took the boat that was slow and started to drive to the first island. The two other men drove the tractor and the trailer ready to the harbour where loading of the sheep would happen. The route was also safer this way because the last leg with the boat (when loaded full) was in this way made in the shelter of islands (Figure 22).

Figure 22. The route of the boat while collecting the sheep from the islands.

After making the trailer ready the two men jumped in their fast motorboats (each having their own) and arrived to the first island.

The first island

This island was 30 hectares. There were five cottages, which were fenced out of the area that was possible for the sheep to graze. The island had 17 ewes.

The first thing to do was to pick up the metal fence elements from the ferry. All three men were doing this job. The fences were placed so that they made a passageway to the ferry. On one side was the water, and on the other side was the fence. In other words, the guiding fence followed the shoreline and the line was 10-15 meters wide (Figure 23.). In the island were also on standby some wire mesh fence rolls. Those were opened and used to make the passageway even longer. Altogether the leading fence was about 50 meters long. While the farmer and the worker went to searching for the sheep, the man with his dog took a

position where he could stop the sheep if they were to choose the wrong way. The dog was in a lead. A problem here was that the sheep were not usually allowed access to this waterfront area where the transport boat and the planned passage line were.

Figure 23. Building the leading fence along the shoreline.

This island also had some forest. The sheep were about 268 meters from the loading area. Not until the third try they succeeded to bring the sheep on the passageway. When finally, on the line, they were pushed fast until they reached the area where the metallic fences started.

Figure 24. Pushing sheep in to the transport boat. Leading fence on the right side of the passageway and sea on the left side

Then the men carried the end of the fence and made a curve of it behind the sheep. While the sheep were moving on, the men – carrying the fence – were following the sheep. When the passage area was closed, the men took one loose fence, followed the sheep and used it for pushing the last sheep into the boat (Figure 24.). All sheep moved to the boat willingly, without help. After gathering the sheep, the metallic fences were picked up, but the fence netting was left behind. Searching for the sheep and getting them in the boat took 43 minutes. In total, it took 109 minutes to gather the sheep from this island (Table 10.).

The second island

The second island was a tiny two hectares' bird nesting island. The sheep, eight ewes, had been there only some weeks. Method used: pushing (and pulling: sheep in the boat from before). Workers participating: two men who pushed the sheep (Figure 25.) and one man (with a dog on a leash) who was mostly standing at a certain point. Bringing the sheep to the transport boat took 15 minutes (Table 10.). Leading fences were eleven metallic fences.

Figure 25. Ewes from the second island were pushed in to the boat.

The third island

This island was 16 hectares and it hosted 23 ewes. Participating in the job: two men. Gates used: 11 light metal fences. Method used: pushing with humans. When arriving to the island, the first thing to do was to make the passageway to the boat. Eleven fences were used all placed after each other so that they were building a fence against the island. The both men started to go into the island, under the wind searching for the sheep. The sheep were at the wind side of the island, as they had been also on the other islands (Figure 26.).

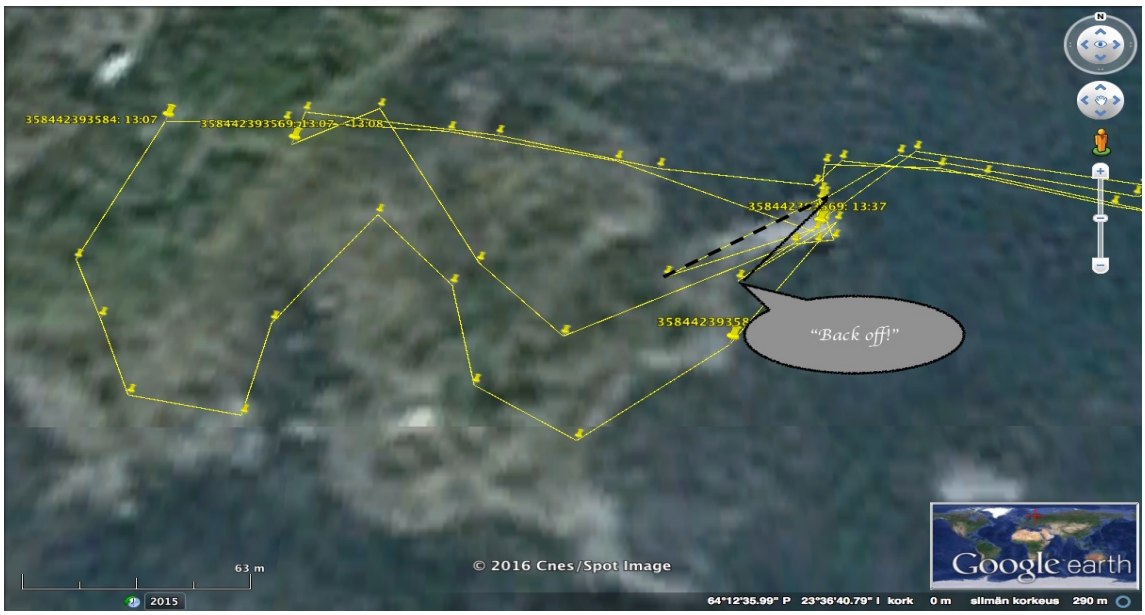

Figure 26. Showing the route of the both men when catching the sheep.

The plan was to push the sheep towards the shoreline and then make them walk the passageway right into the boat. The workman went behind the herd and the farmer watched out so the sheep did not turn around or inside the island. Moving the sheep and getting them to the right track took 15 minutes mostly waiting and only lightly pushing them. When the herd arrived to the metallic fence line one of the sheep just got nuts and run away. The men decided to keep on pushing the other sheep inside the ferry first. That was done fast and without further problems (Figure 27.). At that point they did not pay any attention to the one runaway sheep. When they had the other sheep well in the ferry, the both men took a 'keep off' – attitude as soon as possible. They went circa 50 and 30 meters at the opposite side from the lonely, scarred sheep and kept quiet. As soon as the lonely sheep saw the men had gone, it run through the water and the shortest way to the boat and inside with her herd mates. The men came warily closer, they both carried a fence element in front of them, ready to block the sheep if needed. Gathering the sheep, including the one runaway, took 36 minutes (Table 10.).

Figure 26. Pushing the sheep into the boat.

Table 10. Collected data when gathering sheep from islands.

Observation	**Hectares**	**Meters**	**Minutes**	**Pieces**	**Average km/h**
1. First observation					
Biotope, hectares	30				
Sheep, how many				17	
Humans				3	
Dogs				1	
Fence, meters		50			
Making the pen/leading fence ready			54		
Bringing and loading the sheep			43		
Farmer, walking in the biotope		973			0,8
Worker, walking in the biotope		1099			0,6
Removing the pen			12		
Sum minutes			*109*		
2. Second observation	**Hectares**	**Meters**	**Minutes**	**Pieces**	**Average km/h**
Biotope, hectares	2				
Sheep, how many				8	
Humans				3	
Fence, meters		22			
Making the pen/leading fence ready			4		
Bringing and loading the sheep			15		
Sum minutes			*19*		

3. Third observation	**Hectares**	**Meters**	**Minutes**	**Pieces**	**Average km/h**
Biotope, hectares	16				
Sheep, how many				23	
Humans				2	
Fence, meters		22			
Leading fence ready and removing it			12		
Bringing and loading the sheep			36		
Farmer, walking in the biotope		573			0,7
Worker, walking in the biotope		822			0,4
Sum minutes			*48*		

4.2.5 Hereford cattle in seaside biotope

This observation was done in a traditional rural biotope that was ten hectares' meadow close the sea. There were seven cows and their calves. The job was to gather the mob, put them in a trailer and move them to another pasture. The farmer and his worker did this work. The method used was pushing. Used gates: nine separate gates for cattle.

Figure 28. The trailer was made ready for the cattle to arrive. Leading fences were on both sides.

The worker took the tractor and a trailer and drove to the site. The farmer took his four - wheel drive utility vehicle and loaded on its trailer the nine metallic fence elements that were needed for the work. The trailer was outside the electric fence and placed so that trailers end pointed straight to the gate to the biotope. The trailers back door was opened and the nine gates were placed on both sides so they made a gateway from the biotope in to the trailer (Figure 28). The trailer had a floor that was laid down so the trailers floor was at about the same hight as the terrain outside. The gate (two wires) was opened to the field.
The animals were at the other side of the biotope, ca. 500 meters away but all together in one mob. The two men started to go towards the animals. They were carrying a roll of white rope (electrical wire) with them. Another (ca. 100 meters) wire was tied up at the pale close the gate while the other end was left loose and left on the ground following the fence line. When the worker was getting close, the cattle started to run and run about 50

meters, then stopped, turned around and had another look at the men. The men did not run after the animals. Now the workman did a longer way behind the mob (Figure 29, blue line) and so the two men come together from the same side walking slowly towards the mob. They opened the electric wire roll and made a 'living fence' between them while walking and steering the mob to the trailer (Figure 30.). The distance between the men while pushing the cattle differed from seven to 50 meters depending on the situation. When passing over a difficult place, the pitch that had a lot of water in it (a broken bridge), they waited until the cattle hade decided to jump over without putting more push at them.

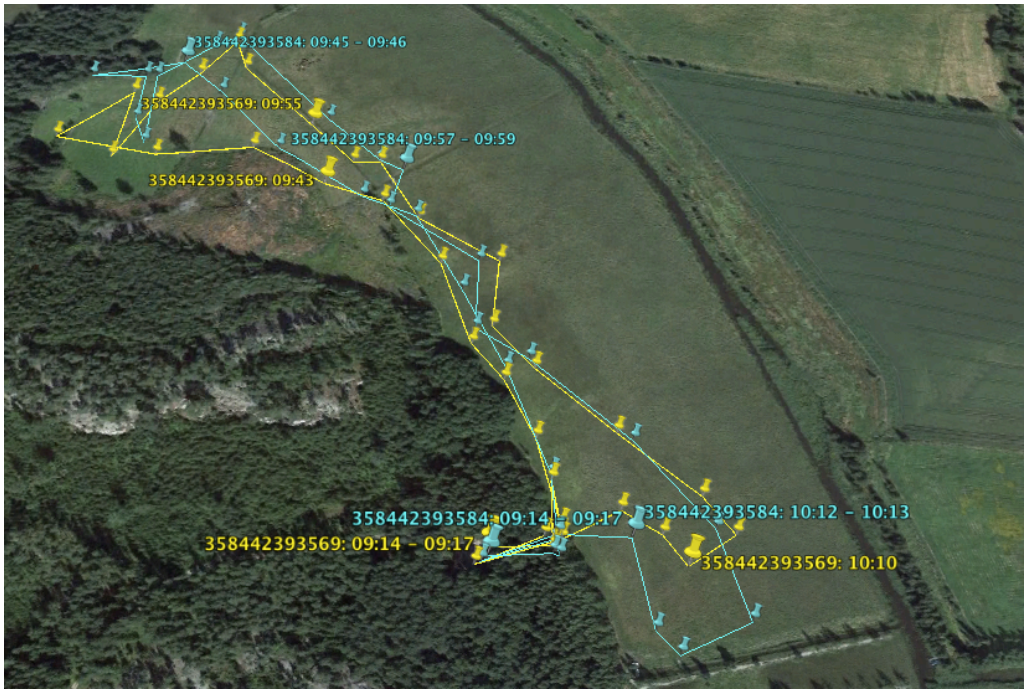

Figure 29. Cattle were brought from the left end of the biotope and the trailer was in the forest. Note that they were first pushed past the gate that was leading to the trailer.

The farmer and the worker did make almost as long walking route in the biotope. In average the speed for the farmer was 0,9 km/h and for the worker 1,2 km/h (Table 11.). When pushing the cattle, both speeded down so the farmer had then in average 0,8 km/h and the worker 1,1 km/h walking speed. When they were arriving to the gate with the cattle, they first pushed them a little bit past the gate. Then they turned them back towards the gate. Before this, the end of the wire that had been tied up on the pale close to the gate had been picked up. It was with this wire the animals were now directed to the gate. Little by little the area where the animals were, was made smaller. When coming to the gate they kept the wire tight. The farmer was following the mob on the side so they could see him all the time with their right eye. The men pushed the animals towards the opening slowly and quietly. When entering the gate, the animals made the decision to go through the gate inside the gateway that lead to the trailer. When all the animals were in the alley, metallic

fences were moved so the area got smaller. The cattle walked into the trailer and the trailer was closed. It took 86 minutes to gather these animals. (Table 11.)

Figure 30. Pushing cattle. The farmer on the left side was walking at the side of the mob so the cattle could see him.

Table 11. Time used when taking cattle from the seaside biotope into the trailer.

Observation	**Hectares**	**Meters**	**Minutes**	**Pieces**	**Average km/h**
Biotope, hectares	10				
Cattle, how many				14	
Humans				2	
Fence, meters		27			
Making the pen ready			23		
Bringing the cows and calves			37		
Farmer, walking in the biotope		1543			0,9
Worker, walking in the biotope		1610			1,2
Loading the cattle in the trailer			5		
Removing the pen			21		
Sum minutes			*86*		

4.2.6 Checking the cattle

One evening in the autumn (30.8.2016) the cattle tracker I used in wind testing had sent an alarm that the cow (Original) had been motionless over four hours. Nothing was wrong with the cow, but the collar had been detached so I had to go and pick it up. At the same

time the farmer was checking her cattle so I joined her for that visit. The biotope was a seaside area, 18 hectares and there were twelve cows with their calves and one bull. Checking was done by the farmer. While doing the checking the cattle were trained with goodies.

Figure 31. Calling and searching the cattle. The farmer was carrying a bucket with food.

When we came to the site we did not see or hear anything. The farmer had two buckets of feed with her for training the animals (Figure 31.) We started to follow the right side of the electric wire fence. The farmer observed that one wire was loose so she had to come later to fix it. I found the tracker. We walked and she was calling the animals now and then. When we had walked 20 minutes the first cows come from the high reed. And soon followed of the rest of the mob (Figure 32.). She put some food on the ground, here and there, walking and trying to get the cows to follow her. The cows were curious about our buckets and although they were already empty we had at last to leave the buckets for the cattle to examine. After that she went to repair the fence and I was waiting by the battery to connect it again when the fence was ready. It took 68 minutes to check this mob (Table 12.).

Figure 32. The curios and brave cows are coming first. The calves and the more suspicious animals are walking after them.

Table 12. Time used for checking the cattle.

Observation	**Hectares**	**Pieces**	**Minutes**
Biotope, hectares	18		
Cattle, how many		25	
Humans		1	
Searching the animals			20
Checking the animals, teaching them			31
Repairing the fence			17
Sum minutes			*68*

4.2.7 Checking sheep, case 1.

This was a five-hectare riverside biotope. There were 58 sheep including ewes and lambs. The farmer did the work alone. She used goodies to train the sheep to come when called and keep them tame. This time the sheep did not come when the farmer called so she had to walk, call and search for them (Figure 33.).

Figure 33. Calling and searching for the sheep. The farmer is carrying a bucket with oats.

When the sheep were found, they were in the shade under some thick bushes. The farmer gave a small number of oats from her bucket for some of them, but not for all. Four or five sheep were tame and stayed around the farmer as long as she was there. Other sheep from the herd were first interested but very soon went back to the bushes. Counting the sheep and observing them took 14 minutes (Figure 34.). While observing the sheep, the farmer did not make them to move. Checking the sheep took 45 minutes in total (Table 13).

Figure 34. Counting and looking at the sheep.

Table13. Time used for checking the sheep.

Case 1	**Hectares**	**Pieces**	**Minutes**
Biotope, hectares	5		
Sheep, how many		58	
Humans		1	
Taking the bucket			2
Searching the sheep			17
Counting, observing			14
Walking back			12
Sum minutes			*45*

4.2.8 Checking sheep, case 2.

This riverside biotope was divided into two separated blocks. The first block was six hectares and there were 23 sheep. The second block was eight hectares and there were 30 sheep, three bulls and two horses. The farmer did this work using two working dogs.

Checking the first area

When arriving to the site, the whole mob was already close to the gate. Counting the sheep there took time only one minute (Table 14.). The farmer observed that the sheep had not been grazing the other bank of the river. She had to drive the sheep there and help them to go over the water. Driving the sheep was done so that the farmer walked first and chose the easiest way and the two dogs brought the mob after her. When arriving to the water, it was

obvious the sheep did not feel going over it. The river was not wide at the chosen place, but the river bottom was muddy and slippery. With the help of the dogs it took four minutes to take them over (Figure 35.). When the sheep were well on the other side they were left there.

Figure 35. Taking the herd to the other side of the river.

Checking sheep and moving them to another place took 15 minutes (Table 10.).

Table 14. Time used for checking and moving the sheep.

Case 2, first area	**Hectares**	**Pieces**	**Minutes**
Biotope, hectares	6		
Sheep, how many		23	
Humans		1	
Dogs		2	
Counting the sheep			1
Driving sheep to other side of the river			11
Leaving the site			3*
Sum minutes			*15*

* Estimated time

Checking the second area

The following block by the river was eight hectares. There were 30 ewes, three bulls and two horses. It took four minutes to walk from the car to the site. The horses came first to the farmer so she could control how they were and the bulls were also in sight. The farmer had to send the dogs to search for the sheep. When the dogs found the sheep, they brought

them to the farmer. While the farmer was counting and observing the sheep, the other one of the dogs brought also the bulls for closer examination (Figure 36.).

Figure 36. Checking the sheep and the bulls. Dog assistance.

After that the farmer decided to drive to sheep to the water source, because she was unsure if the sheep were using it. In total, it took 20 minutes (Table 11.).

Table 15. Time used for checking this biotope.

Case 2, second area	**Hectares**	**Pieces**	**Minutes**
Biotope, hectares	8		
Sheep, how many		30	
Bulls, how many		3	
Horses, how many		2	
Humans		1	
Dogs		2	
Walking from the car to the biotope gate			4
Searching and bringing the sheep			4
Counting, observing			3
Moving them to a water source			5
Walking back to the car			4
Sum minutes			*20*

4.3 Wind testing

To compare the movements of the cow and wind direction and speed, 1538 samples were collected. The collected data showed that the cow moved 587 times on headwind, 556 times on tailwind and 395 times on crosswind. Appendix C is showing a model of the samples collected during one day. A percentage of these numbers were 38 % on headwind, 36 % on tailwind and 26 % on crosswind. If the wind did not have any effect on the cows moving in the biotope there would not have been any difference and all these three had been 33,3 % each. The data was analyzed using a chi square goodness of fit test (χ^2).

Table 16. Results from the bookkeeping 8.8. - 30.8.2016 and analyzing it with a chi square goodness of fit test.

	Observed	Expected	(O-E)	$(O-E)^2$	$(O-E)^2/E$
Headwind	587	512,154	74,846	5601,923716	10,93796732
Tailwind	556	512,154	43,846	1922,471716	3,753698528
Crosswind	395	512,154	-117,154	13725,05972	26,79869671
				$\chi^2=$	41,49036256

The result from this testing showed that the assumption that wind does not influence on animal movements was rejected, $\chi^2=41$, df=2, $p \leq 0.05$. According to the test, the wind and its' direction and speed has a strong effect for cattle movements in the biotope.

The first counting included 1538 samples when the wind speed was over 0,0 m/s. The Finnish Meteorological Institute (Finnish Meteorological Institute, w.y.) is classifying wind speed 1–3 m/s as light wind and wind over 3 m/s as moderate wind. 463 samples were between1–3 m/s wind speed. To analyze, if the result is different when wind speed is between 1–3 m/s a new counting was made. The second counting showed that the cow moved 169 times on headwind, 159 times on tailwind and 135 times on crosswind. A percentage of these numbers were 37 % on headwind, 34 % on tailwind and 29 % on crosswind. During the testing time in august wind was moderate (over 3 m/s) only in five samples. It is not possible to make any conclusions from so little data.

5 Discussion

Livestock were gathered in Finnish traditional rural biotopes using two main methods and several different tools. These methods were pulling and pushing.

When managing cattle, there were two main differences in the circumstances. The traditional rural biotope could be close the farm or far off. If it was close, the cattle could walk by themselves to the biotope in spring and back home in autumn. If it was further away, the farmer had to transport the animals there. In the autumn, the farmer first had to gather them in a corral, trailer or transport boat before being able to take them back home.

When the cattle were walking home

If the cattle could walk home by themselves, they were mostly pushed by the lack of grass. When there was no more to eat at the biotope, the gate was opened to the field pasture nearby and the cattle could move there when they wanted. This sounds as an easy way to

move cattle and according to Smith (1988, 161,222) fresh feed is a powerful inducement. However, this was only useable when the biotope was empty of grass or the cattle had eaten all good, young and tasty grass from the area. But if the animals were not hungry, they did not come or move. This happened in one of the traditional rural biotopes I observed (observation 2). The farmer told that he had tried to gather his cattle the first time two weeks ago but they did not come, because they still had so much to eat at the biotope. Taking home animals with this method is therefore likely to work only late in autumn. If one needs to gather or collect the animals before that, some other method should be used.

When the cattle were penned

Pushing was the most commonly used method for both cattle and sheep. The tools used for pushing varied from farm to farm. When talking about cattle, the most common way to push them was by humans. When pushing cattle, it was many times a combination of different pushing tools as humans, quad bikes, dogs and lack of grass as mentioned above. Using quad bikes or other vehicles was more common at large and open seashores in Ostrobothnia and Northern Ostrobothnia than in Southwest Finland.

In literature pushing is divided in to driving and herding. The difference between these two is according Smith (1998), if the human could use pressure towards the animals wisely or not. If he was sensitive and knew, how much pressure the animals needed or tolerated and used the right amount of pressure at the right place of the mob – then it was called herding. (Smith, 1998 13,104-105.)

I was witnessing while making observations when the farmers were practicing this in many real situations. For example, when I was making observations at traditional rural biotope five. The farmer and his worker were pushing slowly the mob forward when they came to a muddy ditch. The animals stopped and started to look behind. Instead of putting more pressure and trying to force the animals to jump over, the men took a few steps backwards and waited. According to Smith (1998), good herders do good things without thinking about it. They make it naturally, as in this case when they were calming down the situation. (Smith, 1998, 26, 151). The men were ‘talking’ to the cattle a wordless language the cattle understood. After a while the cattle were moving easily and confidently over the ditch. Smith (1998), Albright and Arave (2002) were talking about the relation between the herders and animals (Smith, 1998, 17; Albright & Arave, 2002, 189). Six farmers out of thirteen in the interview, emphasized how important it was that it was the same person who was handling the cattle. The relation between the cattle and human was one key for the success.

I was impressed how quiet the cattle were handled when making these observations. No shouting, whistling or other noise. Literature confirms that cattle is sound sensitive and should be handled quietly (Beaver & Höglund, 2016, 67, Albright & Arave, 2002,195).

Pulling was mostly combined with pushing the cattle.

When concentrated feed was used for pulling, it could be an ongoing process under the whole summer period. It was simply a system that had to be learnt to the herd. When the animals were checked, goodies were given as reward for the first animals to come or if the mob was not so large, to all of them. Animals were lured to follow the person who was carrying the bucket and led to the place where they later would be penned. Sometimes there was a permanent pen where they were learnt to come. This was possible when the mob was not so big. Already ten cows or more can make it very uncomfortable to the farmer if he is surrounded by the cattle with a bucket of goodies. Even though the animals are kind, it is a safety issue. Smith (1998) is talking about the human personal safety distance and how problems arise if the animals do not respect it. If you have a bigger mob it is also impossible to reward all animals and after a time only a handful will follow you with your bucket. (Smith, 1998, 222, 242). This was seen when I did the observations while farmers were checking their animals. A more rewarding tool is, if it is something for the whole mob, also for the shy ones. For example, letting them to go to a new block where they all could start grazing fresh grass. Many of the Finnish cattle farmers interviewed in this study used this method.

When lack of grass was mentioned in the interviews as the pushing tool a bale of silage or hay was on the other hand the pulling tool. To handle big hay or silage bales requires that the farmer has a tractor in the biotope. Many biotopes are far away from the farm center or they are on islands. Using bales can be impossible. When it is not possible to train the whole herd using goodies training a working dog is one solution. A dog is also a good alternative when the farmer has not workers or familymembers who could help when gathering the cattle. No one of the interviewed or observed farmers did the gathering job alone. In average the cattle farmers who used the pushing method had 2,6 humans to do the work and those who were using both the pull and push method had 4,8 humans doing the job. These were the results from the interviews.

Observations from the two traditional rural biotopes when gathering cattle represented one pushing method and the other combined pushing & pulling method. Building the temporary corral took 51% of the working time when pushing the cattle and 87% of the working time when the method was both pull and push. Even if we don’t include building

times in the working time, the pushing method was a winning strategy when gathering cattle.

Sheep

When managing sheep in traditional rural biotopes, all interviewed sheep farmers were using pushing tools. Lack of grass was also mentioned, but as opposed to the cattle situation, only few sheep farmers used it as a pushing tool. Working dogs were in use in many farms. Also in three observations the farmers used working dogs while gathering and checking sheep. Dogs were far more common when managing sheep than cattle. That is easily understood because a dog releases the grouping behavior in sheep (Beaver and Höglund 2016, 199). One man and one dog can gather and move over 100 sheep also in Finnish conditions as I saw when I was observing biotope number three. Many of those who used working dogs for taking the herd away from the biotope also used them when doing the checking in the biotope. It was lesson for both the dog and for the sheep. Those who had a dog also had the opportunity to gather the herd at any time. Some interviewed sheep farmers told they had thought to buy a sheepdog in a future.

The pushing tool was mainly either humans or dogs. All the dogs I could follow when observing the fieldwork were well trained for this work and it was a joy to follow their work. When only humans were pushing the sheep, a lot of knowledge and/or intuition of sheep behavior was needed. When I did the observations in the islands I was witnessing how sensitive one must be while handling the sheep. Reading their body language the farmer could see from a distance which direction the herd was going to take. Anticipating the situation and then leading the herd into the fenced area was the critical point of the job. In contrast to cattle farmers, some sheep farmers did the gathering work alone but were using working dogs.

Sheep are greedy animals (Beaver & Höglund, 2016, 200) and the interviews were confirming this. Those who used the pulling method where doing it with feed in a bucket and maybe also by calling the animals. Grandin (2008, 48) is talking about training the animals. Many farmers used feed or goodies for gathering, leading and keeping the animals tame. It was oats in the bucket mainly, but also bread. From farm to farm there were different ways to work. Some used feed only when penning the sheep and others always had some bread with them when checking the animals. In contrast to cattle, sheep are strong followers (Beaver & Höglund, 2016, 200) and if you get some of the herd to follow you, it is likely the rest of the herd will come also. This habit was made use of in observation number three when loading sheep in the trailer. One of the sheep was gently

lifted into the trailer and all the others followed. The literature names ‘the Judas animal’ (Smith, 1998, 16, 237; Beaver & Höglund, 2016, 34, 202,) a trained sheep or more often a goat (Grandin, 2008, 49) is used as a tool when loading sheep. This tame goat is leading the herd of sheep into the trailer, into the pen or many times into the slaughterhouse.

Those who were interviewed and used the pushing method when gathering sheep were all using one or two working dogs. Those who used both pull and push method had in average one more human doing the job. But there were differences. Three farms had only two humans working, but there were farms where five or even six humans worked to gather the sheep. Least time used a farmer, who had two dogs, two people working and they did not build any pens or fences when loading the sheep in to the trailer/ transport boat. Building helping fences was a big and time consuming work. Most time was used by farmers who had large areas that were not divided into smaller blocks.

The time that was used for checking did not affect the time used for gathering the sheep. Those who did not report any checking time had other people doing that work. For example, fishermen, cottage owners, 4H or other people living close the traditional rural biotopes.

All observations represented the pushing method. Three observations were about using dogs and one human mostly giving orders for the dog. Those who did not have a dog, had at least two, but in most cases three people working. In the light of this study a working dog was compensating one or two humans. Building fences and pens was not common when the dog was included and that was also saving time.

Wind

In two interviews the interviewee informed that he went first to the wind side “Because it was most likely the cattle were there”. In both cases, it was about cattle grazing in large islands. The farmer could spare time by localizing the cattle when driving around the island by boat to the wind side. When doing the observations at islands sheep were located all times at wind side of the islands.

Considering these findings from the interviews and from the observations, the result from my wind testing that was “Wind direction and power affects cattle movements in the biotope” sounds likely. Wind testing could be repeated in different environments and in different windy surroundings. Identifying the effect of wind can result in remarkable time – savings when managing livestock. Instead of walking through bushes hours while searching livestock one could observe wind direction and speed and make a conclusion where to search in a first place.

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Images

Figures 13, 17, 26 and 29 Google Earth.

Figures 4, 7, 20, 22 Ultracom Oy.

All photos are taken by the author: Leila Warén-Backström.

Appendix A

Questions asked for persons who were interviewed.

Samling och infångade av nöt och får på biotoper

Har ni djur på biotoper?
Hur samlar ni in dem? Tar det mycket tid?
Denna forskning har som syfte att kartlägga olika metoder att ta fånga in och samla boskap på biotoperna.
Det finns många biotoper som ännu skulle behöva betande djur och djurägarna kunde dra nytta av det. Men är infånagde av djuren ett flaskhals ?
I och med att svara bidrar du att de goda metoderna sprids till andra djurägare och möjligen får du själv också några tips. Du kan följa forskningen 1.6.-1.10. från bloggen **cattlebiotopes.blogspot.com** .
Du kan också delta genom att ringa: 040-523 1282/ Leila ☺
Forskningen är beställt av Karjataidon tila och jag utför forskningen som mitt slutarbete (Master) till Novia yrkeshögskola, Raseborg.
Svaren behandlas konfidentiellt, vilket betyder att de hanteras utan person- eller gårdsuppgifter.
Svarstid har du tills 30.7. 2016.
Mera uppgifter om forskningen:
lwaren@gmail.com

HANTERING AV BOSKAP PÅ BIOTOPERNA

Vår biotop befinner sig :
(Landskap)

1. **Djuren**
   a) Vilka djur betar på biotopen?

2. Siffror

a) Hur många gånger per betesperiod fångas djuren in ?
(i en fålla, trailer eller in i en inhängnad)

Betesskiftes storlek ha	Tid att infånga och samla djuren	Antal djur på skiftet	Antal människorna som hjälper	Antal hundar som hjälper	Andra hjälpmedel, vilka?

3. Metoder att samla och fånga in djuren

a) Hur sker djurens infångade
b) Har ni byggt en stadigvarande fålla?
c) Används separata grindar – hur många meter tillsammans?
d) Hur mycket tid går åt att bygga fållor/drivfållor per samlingsgång?
e) När hämtas djuren bort från biotopen?

4. Övervakning och granskning av djuren

a) Hur ofta granskas djuren på biotopen?
b) Hur räknar man djuren vid granskningen?
c) Flyttas djuren vid granskningen - hur?
d) Kontrolleras varje djur individuellt vid varje granskningstillfälle?
e) Hur mycket tid ett granskningsbesök tar?

5. Portar

a) Har allmänheten tillgång till området?
b) Vilken typ av portar är byggda för allmänheten ?
c) Hurdana portar används då man transporterar djur?

6. Dricksvatten

a) Hur vattnas djuren?

Appendix B

Methods found from the interviews.
Number is the number of the interview, Pull and Push are the mehtods found. Under these are the tools that were used. In Teaching the interviewed explained how they managed their livestock.

a) Cattle penned
b) Cattle walking home

a)

Number	Pull	Push				Teaching				
1B	Food/ bales	Humans/ 5	Quad bike	Lack of grass			Feeding S			
2B	Food/ bales	Humans/ 6	Quad bike	Lack of grass			Feeding S			
3B		Humans/ 2	Quad bike			Same person				
7A	Food/ concentr.	Humans/ 1+3				Same person	Feeding S		Goodies	Moving
8B	Food/ concentr. &bale	Humans/ 3				Same person	Feeding S		Goodies	Moving
5A		Humans/ 3	Dogs/2-4							
11A	Food/ concentr.	Humans/ 5-6					Feeding S		Goodies	Moving
9A	Food/ concentr.					Same person	Feeding R		Goodies	Moving
8A		Humans/ 2-3		Lack of grass		Same person		Changing blocks		
7B	Food/ bales	Humans/ 3		Lack of grass			Feeding S			
1A	Food/ bales	Humans/ 1+2		Lack of grass		Same person		Changing blocks		
11B	Food/ bales	Humans/ 3		Lack of grass						
2A		Humans/ 1+2	Quad bike	Lack of grass				Changing blocks		

b)

Number	Pull	Push				Teaching				
11A				Lack of grass						
17A	Calling	Humans/1+1		Lack of grass						
13A		Humans/3-4		Lack of grass				Changing blocks		
12A	Calling			Lack of grass				Changing blocks	Goodies	Moving
7A						Same person		Changing blocks		
9B				Lack of grass				Changing blocks		

Sheep

Number	Pull		Push			Teaching				
4B			1	Dogs/1-2		Same person				Moving
5B			Humans/3-5							
5B			Humans/3	Dog/1						
5A	Food/bucket		1	Dogs/2-4						Moving
6B	Food/bread	Calling	Humans/2		Lack of grass	Same person	Feeding S			Moving
7B	Food/bread	Calling			Lack of grass		Feeding R	Handling often	Goodies	Moving
8B	Food/oats	Calling	Humans/4-5			Same person			Goodies	Moving
10B			1	Dogs/2		Same dogs				
11A	Food/bucket	Calling	Humans/5-6				Feeding S		Goodies	Moving
18A	Food/oats&bread		1	Dogs/2			Feeding S		Goodies	Moving
21A	Food/oats	Calling	Humans/3				Feeding S			
1A	Food/oats				Lack of grass					
20A	Food/oats		Humans/2							
19A			1	Dogs/2				Handling often		Moving

Appendix C

Example of collected data from the weather station for one day.

19.8.16 0:00	13,3	94,1	76,3	270	0,7
19.8.16 0:15	13	94,4	76,3	225	0,8
19.8.16 0:30	13,1	94	76,3	270	1,5
19.8.16 0:45	13,1	93,9	76,3	270	1,4
19.8.16 1:00	13,1	93,5	76,3	225	1,6
19.8.16 1:15	12,9	94	76,3	270	1,4
19.8.16 1:30	12,9	94,3	76,3	270	1,6
19.8.16 1:45	13	94	76,3	270	1,5
19.8.16 2:00	13,1	93,9	76,3	270	1,5
19.8.16 2:15	13	94,1	76,3	270	1,3
19.8.16 2:30	12,8	94,7	76,3	270	1,1
19.8.16 2:45	12,6	95	76,3	270	0,9
19.8.16 3:00	12,5	95,4	76,3	225	0,9
19.8.16 4:15	12,5	95,7	76,3	270	0,9
19.8.16 4:30	12,7	95,4	76,3	270	1,2
19.8.16 4:45	12,7	95,1	76,3	270	1,4
19.8.16 5:00	12,8	95	76,3	225	1,2
19.8.16 5:15	12,8	95,1	76,3	225	1,3
19.8.16 5:30	12,9	94,8	76,3	225	1,2
19.8.16 5:45	12,9	94,9	76,3	270	0,8
19.8.16 6:00	12,9	95	76,3	225	0,3
19.8.16 6:15	12,9	95,1	76,3	225	1,7
19.8.16 6:30	13	94,8	76,3	225	1
19.8.16 6:45	13,1	94,7	76,3	225	1,4
19.8.16 7:00	13,1	94,5	76,3	225	1,1
19.8.16 7:15	13,2	94,3	76,3	225	1,4
19.8.16 7:30	13,3	93,9	76,3	270	1,9
19.8.16 7:45	13,4	93,6	76,3	270	1,7
19.8.16 8:00	13,7	92,9	76,3	270	1,1
19.8.16 8:15	14	91,2	76,3	270	1,1
19.8.16 8:30	14,5	89,4	76,3	225	1
19.8.16 8:45	14,4	90,2	76,3	225	0,5
19.8.16 9:00	16,7	77,9	76,3	225	0,9
19.8.16 9:15	16,1	82,3	76,3	225	1
19.8.16 9:30	15,6	85,4	76,3	225	0,7
19.8.16 9:45	15,8	83,7	76,3	270	1,7
19.8.16 10:00	16,5	81	76,3	225	1,9
19.8.16 10:15	16	83,7	76,3	270	2,2
19.8.16 10:30	16	83,3	76,3	270	1,6
19.8.16 10:45	16,1	84,7	76,3	225	1,2
19.8.16 11:00	15,5	87,7	76,3	225	1,1
19.8.16 11:15	15,2	89,1	76,3	225	0,7
19.8.16 11:30	15,5	87,8	76,3	225	1,3
19.8.16 11:45	15,5	88,5	76,3	270	1,2
19.8.16 12:00	15,3	89,2	76,3	270	1
19.8.16 12:15	15,4	88,5	76,3	270	1,3
19.8.16 12:30	15,5	88,8	76,3	270	0,5
19.8.16 12:45	16,2	86,3	76,3	225	0,6
19.8.16 13:00	16,4	85,3	76,3	315	0,5

19.8.16 13:15	16,2	86,1	76,3	270	0,9
19.8.16 13:30	15,9	91,5	76,3	270	0,7
19.8.16 13:45	16	91	76,3	270	0
19.8.16 14:00	16,9	87,7	76,3	270	0,2
19.8.16 14:15	18,3	80	76,3	270	0,1
19.8.16 14:30	18,4	79,9	76,3	0	0,3
19.8.16 14:45	19	77,1	76,3	45	0,2
19.8.16 15:00	18,6	79,1	76,3	270	0,3
19.8.16 15:15	19,6	72,7	76,3	270	0,3
19.8.16 15:30	20,8	67,7	76,3	315	0,5
19.8.16 15:45	20,7	66,4	76,3	270	0,5
19.8.16 16:00	21,6	57,7	76,3	0	0,7
19.8.16 16:15	21	59,7	76,3	315	0,7
19.8.16 16:30	20,5	62,5	76,3	315	0,3
19.8.16 16:45	20,1	62,8	76,3	0	0,3
19.8.16 17:00	19,3	69,7	76,3	45	0,1
19.8.16 17:15	21,6	58,9	76,3	315	0,4
19.8.16 17:30	21,4	57,5	76,3	135	0,4
19.8.16 17:45	20,4	61,2	76,3	315	0
19.8.16 18:00	21,2	54,7	76,3	315	0,1
19.8.16 18:15	20,8	59,3	76,3	45	0,2
19.8.16 18:30	20,7	60,6	76,3	225	0,1
19.8.16 18:45	19,9	61,4	76,3	315	0
19.8.16 19:00	18,9	67,6	76,3	270	0
19.8.16 19:15	18,7	69,8	76,3	270	0
19.8.16 19:30	18,9	68,3	76,3	45	0
19.8.16 19:45	17,7	80,4	76,3	270	0
19.8.16 20:00	16,7	86,2	76,3	270	0
19.8.16 20:15	16,2	89,4	76,3	270	0
19.8.16 20:30	15,6	91,8	76,3	270	0
19.8.16 20:45	15,4	92,5	76,3	270	0
19.8.16 21:00	15,2	93,2	76,3	45	0
19.8.16 21:15	15	92,2	76,3	135	0
19.8.16 21:30	14,5	91,6	76,3	135	0
19.8.16 21:45	14,1	93,1	76,3	135	0
19.8.16 22:00	14,1	95	76,3	135	0
19.8.16 22:15	13,8	95	76,3	135	0
19.8.16 22:30	13,4	95,9	76,3	135	0
19.8.16 22:45	13,5	96	76,3	135	0
19.8.16 23:00	13,6	95	76,3	135	0
19.8.16 23:15	13,5	93,9	76,3	135	0
19.8.16 23:30	14,7	86,4	76,3	270	0,6
19.8.16 23:45	13,9	89,9	76,3	270	0
20.8.16 0:00	14,7	86,1	76,3	270	0,3

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