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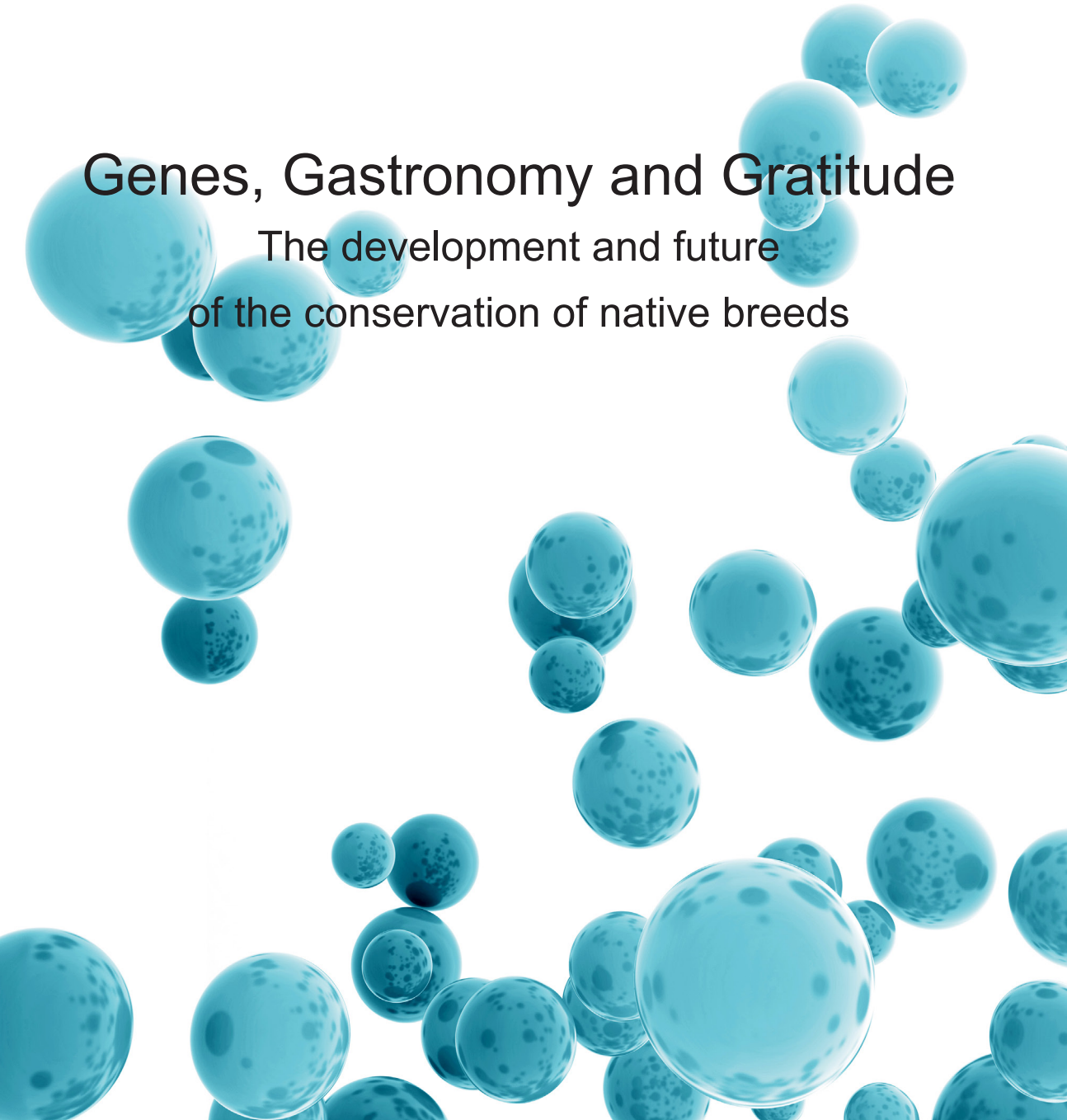
ULLA OVASKA

Genes, Gastronomy and Gratitude

The development and future of the conservation of native breeds



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Genes, Gastronomy and Gratitude

The development and future of the conservation of native breeds

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ACADEMIC DISSERTATION
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the Faculty Council of the Faculty of Management
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UNIVERSITY OF TAMPERE

ULLA OVASKA

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This thesis deals with many of my personal fields of interest: how the past can be seen in the present; the environment and animals; as well as rural areas and livelihoods. It is also a combination of multidisciplinary research. The research process started as a study on political history at the University of Helsinki where I finalised my Licentiate Thesis. After returning from parental leave, I re-defined the scope of my PhD towards environmental policy. Throughout the time, I cooperated with experts on genetics and social sciences.

I would like to thank Professor Pekka Jokinen for supervising me at the University of Tampere, School of Management. He gave me new perspectives on the research and negotiated time-tables that enabled this study to be completed. Dr. Katriina Soini was my second supervisor and a co-writer in the articles. Her role in the process has been of crucial importance in supervising, commenting and providing ideas. I am most grateful to her. I would like to thank Professor Juha Kantanen, who has supported me during the process with his scientific knowledge and excellent contacts, and his contribution to the articles.

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In Sulkava, on the shores of Lake Saimaa, 12th August 2017,

Ulla Ovaska

ABSTRACT

The number of native breeds has diminished globally during the last decades. Many breeds have already become endangered or even extinct. The loss of native breeds is still continuing, which will ultimately lead to a global loss of their genetic resources (AnGR) and thereby a loss of agrobiodiversity. The modernisation of agriculture with new technologies and breeds has especially contributed to the situation in which native farm animals have been replaced by better-yielding breeds. Yet, there are multiple reasons to conserve breeds. Many are adapted to difficult climate conditions, and therefore play an important part in answering to future environmental challenges, such as climate change. In addition to their role in sustainable agriculture, there are other reasons to conserve native breeds including, e.g., their role in the landscape, cultural history and rural livelihoods.

This research examines the development and future of the conservation of native breeds in two case studies: the conservation of the Yakutian Cattle in the Sakha Republic in the Russian Federation and the conservation of native breeds in Finland. The main research questions examine: how the need for conservation and its meanings have changed over time and what landmarks can be identified; how different actors have argued for the need for conservation, how discourses have developed and what kinds of coalitions have been formed; and how different arguments are translated into policies and policy-making and how the conservation is organised. The research setting comprises: 1) environmental governance dealing with institutions, actors and contents involved with agro-environmental policies, 2) ecosystem services about the benefits ecosystems produce for the well-being of humans and the values underlying these services, and 3) an institutional approach which contributes to understanding the realisation of policies in practice. These approaches provide three complementary perspectives on understanding the conservation of native breeds, its development and its future.

The study revealed that despite different contexts in the conservation of native breeds, common milestones, arguments for conservation and challenges to it can all be identified. The conservation in both case studies has followed and contributed to international development, and has benefitted from the opportunities that have opened up to conservation at national and local levels. The

arguments for the conservation of native breeds consist mainly of biological, economic, cultural and other social factors. Native breeds can be maintained if there are actors willing to aim for common goals. This requires cooperation between actors and institutions at different levels and sectors of conservation. The ES approach provides a feasible communication tool to achieve this.

Key words: genetic resources, biodiversity, ecosystem services, environmental governance, agro-environmental policy

TIIVISTELMÄ

Alkuperäisrotuisten kotieläinten määrä on vähentynyt maailmanlaajuisesti viime vuosikymmenten aikana. Osa roduista on vaarassa hävitä tai jo hävinnyt kokonaan. Tämä johtaa niiden geenivarojen menetykseen ja samalla maatalouden biodiversiteetin vähenemiseen. Erityisesti maatalouden modernisaatio uusine teknologioineen ja rotuineen on johtanut siihen, että alkuperäisrotuja korvataan parempituotoksisilla eläimillä. Alkuperäisrotuja tulisi kuitenkin säilyttää lukuisista syistä. Ne ovat sopeutuneet vaikeisiin ilmasto-olosuhteisiin ja ovat siten tärkeitä varautumisessa tulevaisuuden ympäristöhaasteisiin kuten ilmastonmuutokseen. Alkuperäisrodut ovat tärkeä osa kestävää maataloutta ja niitä suojellaan mm. maisemallisten ja kulttuurihistoriallisten syiden vuoksi. Roduille on myös käyttöä maaseutuelinkeinoissa.

Tässä opinnäytetyössä tutkitaan alkuperäisrotujen suojelun kehitystä ja tulevaisuutta kahden tapaustutkimuksen avulla. Ne ovat jakutiankarjan suojelu Sahan tasavallassa Venäjällä ja alkuperäisrotujen suojelu Suomessa. Tärkeimmät tutkimuskysymykset ovat: 1) kuinka suojelun tarve ja merkitys on muuttunut ajan myötä ja mitä virstanpylväitä voidaan tunnistaa; 2) kuinka eri toimijat ovat argumentoineet suojelun tarpeen puolesta, miten diskurssit ovat kehittyneet ja millaisia koalitioita on muodostettu ja 3) kuinka erilaiset argumentit ovat muotoutuneet suojelun politiikoiksi ja kuinka suojelu on järjestetty. Tutkimuksessa käytetään ympäristöhallinnan, ekosysteemipalveluiden ja institutionaalisen lähestymistavan käsitteitä. Ympäristöhallinta tarkastelee maatalouden ympäristöpolitiikkaan liittyviä instituutioita, toimijoita ja sisältöjä. Ekosysteemipalveluissa on kyse ekosysteemien ihmisten hyvinvoinnille tuottamista hyödyistä ja niihin liitetyistä arvoista. Institutionaalinen lähestymistapa analysoi politiikkojen käytännön toimeenpanoa. Lähestymistavat tuottavat kolme toisiaan täydentävää näkökulmaa alkuperäisrotujen suojelun, suojelun kehityksen ja tulevaisuuden ymmärtämiseen.

Tutkimus osoittaa, että huolimatta suojelun erilaisista konteksteista, yhteisiä virstanpylväitä, argumentteja ja haasteita voidaan tunnistaa. Molemmissa tapaustutkimuksissa suojelu on seurannut kansainvälistä kehitystä ja myös myötävaikuttanut siihen. Suojelua on edistetty kansallisella ja paikallisella tasolla

hyödyntämällä mahdollisuuksia, jotka suojelulle ovat avautuneet kansainvälisen kehityksen myötä. Alkuperäisrotujen suojelun puolesta argumentoidaan ennen kaikkea biologisin, taloudellisin, kulttuurisin ja muin yhteiskunnallisin syin. Alkuperäisrotujen säilyminen edellyttää yhteisiä tavoitteita sekä toimijoiden ja instituutioiden välistä yhteistyötä eri tasoilla ja sektoreilla. Ekosysteemipalveluiden käsite soveltuu kommunikaation apuvälineeksi.

Avainsanat: geenivarat, biodiversiteetti, ekosysteemipalvelut, ympäristöhallinta, maatalouden ympäristöpolitiikka

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LIST OF ORIGINAL PUBLICATIONS

This thesis consists of a summary and the following four articles. The Roman numerals (I-IV) are used when referring to these articles in the text.

I Partanen, U. & Kantanen, J. (2009). How a cattle breed became the object of conservation? In Sakha ynaga: cattle of the Yakuts. L. Granberg, K. Soini & J. Kantanen (eds.). Annales Academiae Scientiarum Fennicae, Humaniora 355. Helsinki: Finnish Academy of Science and Letters, 147-168. (*)

II Soini, K., Ovaska, U. & Kantanen, J. (2012). Spaces of Conservation of Local Breeds: The Case of Yakutian Cattle. Sociologia Ruralis 52 (2) 170-191. (**)

III Ovaska, U. & Soini, K. (2016). Native breeds as Providers of Ecosystem Services: The Stakeholders' Perspective. Trace. Finnish Journal for Human-Animal Studies 2, 28-51. (***)

IV Ovaska, U. & Soini, K. (2016). Local breeds – rural heritage or new market opportunities? Colliding views on the conservation and sustainable use of landraces. Sociologia Ruralis. (In Press) (****)

(*) Ulla Partanen is the responsible author of this article. She collected and analysed the empirical data and wrote the manuscript. Professor Juha Kantanen commented on the manuscript from the natural sciences point of view.

(**) Dr. Katriina Soini is the responsible author of this article. Ulla Ovaska analysed the data under her supervision. The manuscript for the article was written in collaboration. Professor Juha Kantanen commented on the manuscript from the natural sciences point of view.

(***) Ulla Ovaska is the responsible author of this article. She analysed the empirical data and wrote the manuscript under the supervision of Dr. Katriina Soini.

(****) Ulla Ovaska is the responsible author of this article. She analysed the empirical data and wrote the manuscript under the supervision of Dr. Katriina Soini.

1 INTRODUCTION

1.1 Biodiversity conservation and native breeds

The domestication of farm animals marks a turning point in the history of humans. It contributed to the change of human societies from tribes of nomadic hunter-gatherers to more permanently settled agriculturists. Agriculture provided an effective way of obtaining food and other benefits from animals and plants, and enabled the development of division of labour and societies at large. Simultaneously human-animal relationships became more interdependent: humans became increasingly reliant on agriculture and farm animals on humans (Gepts et al., 2012; Serpell, 1996).

Native breeds[1], also termed indigenous or autochthonous breeds, are farm animals originating from, adapted to and utilised in a particular geographical region. They form a subset of locally adapted breeds which have been in the region for a sufficient time to be genetically adapted to traditional production systems or environments (Food and Agriculture Organization of the United Nations, FAO, 2012). The conservation of indigenous farm animal breeds is part of a larger discussion about the conservation of biodiversity. The concept of biodiversity was initially introduced in the mid-1980s (Nazarea, 2006), and has since become widely known and recognised. There are several definitions of the concept but the most widely quoted is given by the United Nations Convention on Biodiversity (1992): *Biological diversity means the variability among living organisms from all sources, including inter alia, terrestrial, marine and other aquatic ecosystems and the complexes of which they are part; this includes diversity within species, between species and of ecosystems.* Biodiversity is a broad concept covering the variation among living organisms in all ecosystems, including those in agriculture. Different aspects of biodiversity affect the functioning of ecosystems and the benefits people obtain from them (UK-NEA, 2016).

According to the FAO (2016a), agrobiodiversity consists of the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries.

[1] Native breeds, autochthonous breeds, indigenous breeds, local breeds and landraces are used as synonyms in this thesis (for exact definitions see FAO, 2012).

It comprises the diversity of genetic resources and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production, and those in the wider environment that support agro-ecosystems as well as the diversity of agro-ecosystems. Regarding the conservation of native breeds, the most essential aspect of agrobiodiversity consists of Farm Animal Genetic Resources (AnGR), which the FAO (2016b) defines as animal species that are used, or may be used, for the production of food and agriculture, and the populations within each of them. These populations within each species can be classified as wild and feral populations, landraces and primary populations, standardised breeds, selected lines, varieties, strains and any conserved genetic material; all of which are currently categorised as Breeds (FAO, 2016b).

The relationship between agriculture and biodiversity is complex. Traditional agricultural practices have created native breeds that are currently valued for maintaining biodiversity. Yet, the intensification of agriculture is at the same time threatening their existence (see also Henle et al., 2008). Thus, agriculture both decreases and increases or maintains biodiversity, and native farm animal breeds are part of this development.

Indigenous breeds comprise a group of animals that have been formed by natural selection in their production environments following the needs of producers before genetic techniques were scientifically known and practised. The selection of cattle has been based on adaptability and other traits, such as draught power, and meat and milk yield. The numbers of indigenous breeds have diminished rapidly on a global scale during recent decades, and a large number of breeds have become endangered or even extinct (FAO, 2010).

The main reasons for the loss of indigenous farm animal breeds are improvements in agricultural techniques and global economic development, which have contributed rapidly to the modernisation of agriculture. New farm animal breeds have been created through genetic techniques instead of the slower selection processes that dominated animal breeding for centuries. Global trade in farm animals has spread breeds to different localities from their origin, while keeping native breeds has become more uncertain to farmers due to the combination of better-yielding farm animal breeds and intensive technology. Therefore, farmers are replacing native breeds with other breeds, which ultimately leads to a global loss of AnGR. In addition to the decisions made by farmers, government policies have also contributed to the situation especially by supporting intensive livestock farming (Mendelsohn, 2003; Tisdell, 2003).

There is uncertainty about the exact magnitude of the loss of domestic animals but it is estimated to be considerable: approximately one third of the world's farm animal breeds are endangered with the proportion still increasing. In Europe, up to 40% of the breeds are endangered (FAO, 2010). Most of the indigenous breeds live in remote rural areas in developing countries (Narloch et al., 2011; Drucker et al., 2001), that is, in societies that are going through the most significant transitions (Hoffmann, 2011). Therefore, the extinction of indigenous breeds constitutes a global environmental challenge. According to the classification system of the FAO (2007; 1999), a breed is categorised as extinct if there are no breeding males or breeding females left, and hence it is no longer possible to recreate the breed population. A breed is classified as being in critical condition if:

- either the total number of breeding females is less than or equal to 100;
- or the total number of breeding males is less than or equal to five;
- or if the overall population size is less than or equal to 120 and decreasing and the percentage of females being bred to males of the same breed is below 80 percent.

A breed is endangered if:

- the total number of breeding females is greater than 100 but less than or equal to 1,000;
- or the total number of breeding males is less than or equal to 20 but greater than five;
- or the overall population size is greater than 80 but less than 100 and increasing, while the percentage of females being bred to males of the same breed is above 80 percent;
- or the overall population size is greater than 1,000 but less than or equal to 1,200 and decreasing, while the percentage of females being bred to males of the same breed is below 80 percent.

Within this category, breeds may be further categorised as critical-maintained or endangered-maintained. These categories identify critical or endangered populations for which active conservation programmes are in place or populations which are maintained by commercial companies or research institutions. A breed is referred to as not at risk if none of the above definitions apply and the total number of breeding females and males are greater than 1,000 and 20, respectively, or if the population size is greater than 1,200 and the overall population size is increasing. The genetic diversity within a livestock species can be divided into the diversity within and between breeds. In particular, the between-breed diversity of farm animal species is threatened by the extinction of breeds (Zander, 2006).

1.2 The conservation of native breeds: why and how?

Speaking of techniques for the conservation of AnGR, they are generally divided into two main types: *in situ* i.e. the conservation of living animals and *ex situ*, i.e. cryo-conservation of genetic material such as semen and embryos of the animals. Consequently, the conservation of indigenous farm animal genetic resources can technically be organised in gene banks where frozen sperm and embryos are kept. This so-called *ex situ* form of conservation is nevertheless insufficient for several reasons; the gene bank materials may, for example, disappear or be destroyed. Additionally, if the breeds exist only in gene banks they cannot be conserved securely because frozen material is unable to adjust to changing conditions and there is no natural variation in the breeds. Therefore, it is also important to maintain living animals, and the best option for this is to keep them in their native territories where they have adjusted to the environment. Usually researchers and conservation organisations prefer means of *in situ* conservation (Oldenbroek, 1999; FAO, 2007). Yet, there is a common view that *in situ* and *ex situ* conservation methods are complementary (Paiva et al., 2014).

In situ conservation is not only a technical issue but also requires political will to be properly arranged. On a global scale, there are various international conventions and declarations, including the Convention Concerning the Protection of the World Cultural and Natural Heritage (1972), the Convention on Biological Diversity (1992), the UNESCO Universal Declaration on Cultural Diversity (2001), and the Nagoya Protocol on Access and Benefit Sharing (2010), which establish the basis for the conservation of local breeds and cultures closely associated with them. The concept of biocultural diversity implies that biodiversity incorporates human cultural diversity: they are affected by same drivers and influence each other, i.e. biocultural conservation addresses the loss of biological and cultural diversity (Maffi & Woodley, 2010). Thus, it is broadly agreed in international conventions and declarations that local cultural values and practices, as well as indigenous rights, should be considered in conservation policies, and that the implementation of conservation should include community-based and participatory approaches rather than top-down policies. The bottom-up approach is important for the successful conservation of indigenous breeds because the Convention on Biological Diversity (CBD) stresses the role of concerted global action, however, in reality global action can only consist of the sum total of actions taken by nation states hosting the biodiversity (OECD, 2002).

There are several challenges related to the future of the conservation of indigenous breeds. The main challenge is why and how a society should preserve animals that farmers have abandoned (Mendelsohn, 2003), although nowadays there is a broad understanding of the need to conserve the breeds among researchers and policy-makers. The conservation of native breeds is regarded as important in the agricultural context, because of their adaptive character to challenging climate conditions and environments (FAO, 2007). Based on the ability of native breeds to live in challenging environments and to resist diseases, indigenous breeds may have genetic traits that could be used in producing viable livestock (Mendelsohn, 2003). This perception highlights the importance of AnGR, the genetic resources provided by indigenous breeds.

In addition to the genetic value, several other reasons to conserve indigenous breeds have been recognised. Mendelsohn (2003) argues that the major reasons are environmental or landscape effects, maintaining traditional lifestyles and existence value. These reasons are responses to the global economic changes in agriculture that favour intensive livestock methods. The environmental or landscape effects refer to maintaining local breeds because they are part of local landscapes and environments. The maintenance of traditional livelihoods is concerned with cultural heritage and historic activities represented by indigenous breeds, such as gastronomy and clothing. Finally, the existence value refers to indigenous breeds being part of our past to be preserved for future generations. This is based on, e.g., gratitude to once important landraces, despite of their nowadays lost status in primary agricultural production in many areas. Regardless of the acknowledged importance of native breeds, it is likely that a selection concerning which breeds or even species are the most important ones and worth conserving has to be made in the future (Kantanen et al., 2015; Drucker et al., 2001).

1.3 Sustainable agriculture and native breeds

Modernisation has entailed changes to agriculture in the post-war years, especially in terms of intensification of production by new technologies and breeds. The intensification of agriculture has had an impact on the environment and on land use in rural areas, which has led to an increasing demand for social, environmental and economic sustainability (Bjørkhaug & Richards, 2008). This is related to the discussions on the shift from productivist to post-productivist agriculture, which implies that agriculture is multifunctional and has wider purposes than solely food

and fibre production (Marsden et al., 2000; Horlings & Marsden, 2011; Wilson, 2008; Bjørkhaug & Richards, 2008). Yet, agriculture is facing pressure to both expand production and at the same time manage it in a more environmentally friendly way. The centrality of production remains but there is an increasing understanding of the equal importance of social, environmental and economic sustainability (Bjørkhaug & Richards, 2008; Evans et al., 2002; Wilson, 2008).

One of the main concerns is how to link modernisation with sustainable development concerning social, environmental and economic aspects (Grin, 2006; Horlings & Marsden, 2011). In the current discussion, one has to take into account the concept of sustainable agriculture. Sustainable agriculture is usually defined as an integrated system of plant and animal production practices having a site-specific application that will last over the long term, (1) satisfy human food and fibre needs, (2) enhance environmental quality and the natural resource base upon which the agricultural economy depends, (3) make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, (4) sustain the economic viability of farm operations, and (5) enhance the quality of life for farmers and society as a whole (UN, 2016). There are other definitions for sustainable agriculture (see Hildén et al., 2012), but all in all it has become a core concept in discussions about the desirable future of agriculture. Regarding native breeds, currently the EU is promoting a policy change from conservation to sustainable use (European Commission, 2013). The sustainable use of AnGR is already contained in the Rio Convention (CBD, 1992), as an important part of the conservation of biodiversity.

Sustainable agriculture is nowadays widely understood to be based on ecosystem services that the nature produces. The concept of ecosystem services (ES) has become broadly used to assess the benefits obtained from nature and values connected to them. ES classification provides a system for recognising the services, benefits and values related to native breeds. These include provisioning, regulation and maintenance as well as cultural services, all of which are obtained from these breeds through human-nature interaction (Chan et al., 2012; Satz et al., 2013; CICES, 2013). In this sense, ES collects together different services, benefits and values associated with native breeds, and treats them equally, not placing more emphasis on provisioning services (Rodríguez-Ortega et al., 2014).

The modernisation of agriculture in terms of intensification with new technologies and breeds has reduced the number of native breeds, while yet other aspects of modernisation, such as the needs of economically, environmentally and socially sustainable agriculture, are changing the conservation of landraces.

Modernisation theories have not only emphasised the need for economic development and replacement of traditional values but also the institutionalisation of democratic procedures, which has proved to be challenging (So, 1991; Andorka, 1993). A debate on whether development is a prerequisite for democracy, and whether democracy is a precondition for development has been ongoing for a long time (Sakwa, 2012). Yet, in this context it is important to notice that democratisation has provided key to introducing more locally-based, bottom-up approaches to conservation. The development of alternative food chains and networks that have emerged through bottom-up mechanisms may benefit the conservation of native breeds. The interest in more natural and local food means that by developing new quality definitions associated with locality and region or specialty and nature, new associational networks can be built (Marsden et al., 2000) for the benefit of agrobiodiversity in addition to rural development and livelihoods.

As seen above, a conceptual change (see Haila, 2002) has occurred in the conservation of native breeds. Conservation has developed from the concern of natural scientists regarding the loss of animal genetic resources to a wider societal issue taking into account the variety of services, benefits and values that the native breeds provide societies with. There is a broad consensus on the need to conserve agrobiodiversity, and therefore the current discussion, and this thesis, does not deal with the question of whether native breeds should be conserved, but of how, why and by whom conservation should be carried out (see also Hodge & Adams, 2014). Furthermore, in this thesis, the concept of 'value' is used instrumentally for analyses, while acknowledging that the concept is defined somewhat differently among economists, ecologists and sociologists (see e.g. Chan et al., 2012). The conservation of native breeds is concerned with different policy sectors, e.g., agricultural, environmental and rural policies. This thesis mainly contributes to the discussions on the conservation of agrobiodiversity, and to the identification and realisation of its possibilities in the enhancement of rural areas and livelihoods.

In this thesis, two case studies are used to analyse the development and future of the conservation of native breeds. In addition to this summary essay, the thesis consists of four articles. This summary essay is organised into six chapters. In this introductory chapter, the basic framing and key concepts of the thesis are presented, and the conservation of native breeds is placed in a global context. The second chapter introduces the aims and objectives of the thesis, and presents the four articles that this thesis includes. In Chapter 3 the theoretical framework and approaches are presented. Chapter 4 describes the data and methods for analysis. In Chapter 5, the main results of the articles (I-IV) are summarised. In Chapter 6,

the results are discussed in respect to the development and future of the conservation of native breeds, and further research needs are identified.

2 AIMS AND OBJECTIVES OF THE THESIS

The aim of this study is to research the conservation of native breeds in two case studies, in Siberia and Finland. The first case study is the conservation of Yakutian Cattle in the Sakha Republic in the Russian Far East, where the cold climate and difficult mountainous transport connections make the area challenging in terms of agricultural production. The Sakha Republic has a long tradition of top-down policies both in the Soviet and current era. The second case study is the conservation of native breeds in Finland, which represents a modernised agricultural area dominated by intensive agriculture. Finland is facing the need to shift the focus from the conservation of biodiversity to the delivery of ecosystem services as part of the common agricultural policy (CAP) of the EU. In this study, first, the changes in conservation policy and landmarks related to it will be analysed. Second, the competing arguments, discourses and coalitions for the conservation of native breeds from actors and institutions engaged on different levels and in varying sectors of conservation are studied. Third, the translation of different arguments into policies and policy-making is discussed with an emphasis on the organisation of conservation. The ultimate aim of this thesis is to analyse the development of the conservation of native breeds, and based on that elaborate the future of landraces.

The main research questions are:

1) How has the need for and meaning of conservation changed in time? What kind of landmarks can be identified in the development of conservation?
2) How have different actors and institutions argued the need for conservation? How have the discourses on conservation developed? What kinds of coalitions have been formed?
3) How are the different arguments translated into policies and policy-making? How is conservation organised?

The first article[2] of this thesis answers the first and second research questions, i.e. changes in the need for and meaning of conservation over time and landmarks,

[2] Partanen, U. & Kantanen, J. (2009). How a cattle breed became the object of conservation? In L. Granberg, K. Soini and J. Kantanen (eds.). Sakha ynaga: cattle of the Yakuts. Annales Academiae Scientiarum Fennicae, Humaniora 355. Helsinki: Finnish Academy of Science and Letters, 147-168.

and focuses on the arguments of different actors and institutions regarding the need for conservation. Furthermore, it contributes to the third research question on how different arguments have been translated into policies and policy-making and the organisation of conservation. The article poses the question of how the Yakutian Cattle was able to survive and details its conservation from the 1950s to early 2000s. The case represents a conservation process taking place in a developing agricultural region with a long tradition of top-down policies. The article shows how the modernisation of agriculture, such as improvements in artificial insemination and other techniques, have contributed to the diminishing importance of indigenous breeds, in addition to political intentions of modernising the sector. It reveals contradictory forces that were involved in the agricultural sector: productional-technical efforts to replace native breeds with better-yielding animals vs. new ideas and insights into the importance of genetic resources. In the article, the connection between international efforts to recognise the disappearance of AnGR as a global environmental threat in the scientific community and the development of conservation in the Sakha Republic (in the Soviet era Yakut ASSR) is shown. The article emphasises the role of the scientific community and other enthusiasts as initiators of conservation efforts. Yet, the start of the conservation has remained unnoticed by many of the local people who believe it to have been impossible during Soviet times. The article presents the most important milestones in conservation up to the mid-2000s.

In the second article[3], the main research question is to reveal what kinds of conservation spaces are related to the Yakutian Cattle. This article answers all the main research questions of this thesis, i.e. describes the changes in the need for and meaning of conservation over time; how different actors and institutions have argued the need for conservation; presents discourses and coalitions, and answers how the arguments have translated into policies and policy-making and how the conservation is organised. The article identifies various conservation spaces for the cattle, examines relationships within and between these spaces and discusses their implications for governance. The article shows how the conservation of the Yakutian Cattle is embedded in the international agenda, which has been partly adopted by the Russian Federation. Additionally, the national level actors and their roles in organising the conservation of the Yakutian Cattle are shown. Furthermore, the article identifies the local level actors and their responsibilities for

[3] Soini, K., Ovaska, U. & Kantanen, J. (2012). Spaces of Conservation of Local Breeds: The Case of Yakutian Cattle. Sociologia Ruralis 52 (2), 170-191.

practical conservation work in private households and state farm enterprises. The different arguments presented for the conservation of the cattle in the global context and the perceptions of the scientific community towards the administration in the Sakha Republic and the local communities in the villages of the Eveno-Bytantay district are analysed. The article studies how the genetic resources are emphasised by some actors, whereas for others the conservation is important in terms of keeping the northern areas settled and safeguarding the traditional culture and livelihoods of the Sakha people. It is also reveals to what extent economic reasons dominate thinking among the local people in addition to the social and cultural aspects the breed provides the community with. The role of national media in transmitting the different arguments is also shown.

The third article[4] answers the second research question on the ways different actors and institutions in Finland argue for conservation and contributes to the first research question concerning landmarks. It explores the ES framework for recognising ecosystem services obtained from native breeds; and examines how Finnish stakeholders perceive the benefits and values of native breeds within the ES framework. In this article, the Common International Classification of Ecosystem Services (CICES, 2013) is used. The CICES framework recognises three categories of ecosystem services: provisioning, cultural and regulation and maintenance. The results reveal that the native breeds are linked to all categories of ES and viewed much more broadly than could have been anticipated based on the existing research literature, and both benefits and values related to native breeds could be identified. The literature on ecosystem services provided by agrobiodiversity has only emerged in recent years, and it is still scarce in particular concerning indigenous breeds. Despite this, stakeholders were able to identify ES following the ES classification.

The aim of the fourth article[5] is to explore the governance structures and agencies related to the conservation of local breeds. It answers all the main research questions on the need for and changing meanings of conservation over time, landmarks, as well as the argumentation of different actors and institutions towards conservation, presents discourses and coalitions, and finally answers how different arguments are translated into policies and policy-making and how the conservation is organised. The article analyses *in situ* conservation of Finnish

[4] Ovaska, U. & Soini, K. (2016). Native breeds as Providers of Ecosystem Services: The stakeholders' perspective. Trace. Finnish Journal for Human-Animal Studies 2, 28-51.

[5] Ovaska, U. & Soini, K. (2016). Local breeds – rural heritage or new market opportunities? Colliding views on the conservation and sustainable use of landraces. Sociologia Ruralis. In Press.

indigenous breeds. So far, the emphasis of AnGR policies has been on conservation contexts but local breeds also have the potential to contribute to rural development and livelihoods. Furthermore, EU agro-environmental policies direct conservation towards the production of ecosystem services which can be developed for the enhancement of rural areas. Developing and implementing successful conservation policies and sustainable use of local breeds in rural livelihoods requires knowledge on how landraces are valued by different stakeholders and what kinds of policies and practices are preferred for their conservation and sustainable use. The research is based on interviews with stakeholders who are active on different levels and in different sectors of conservation. The results are discussed with regard to ecosystem services and human-animal interaction. The results highlight the broad diversity of perceptions of the stakeholders. Additionally, on the question of ownership the opinions differed quite broadly. The interviewees had strong perceptions on the right and wrong ways to carry out conservation, which led to colliding views and provoking statements about conservation.

In the following figure (Figure 1.), the main theme, research questions and the role of the different articles and case studies in answering these questions are presented.

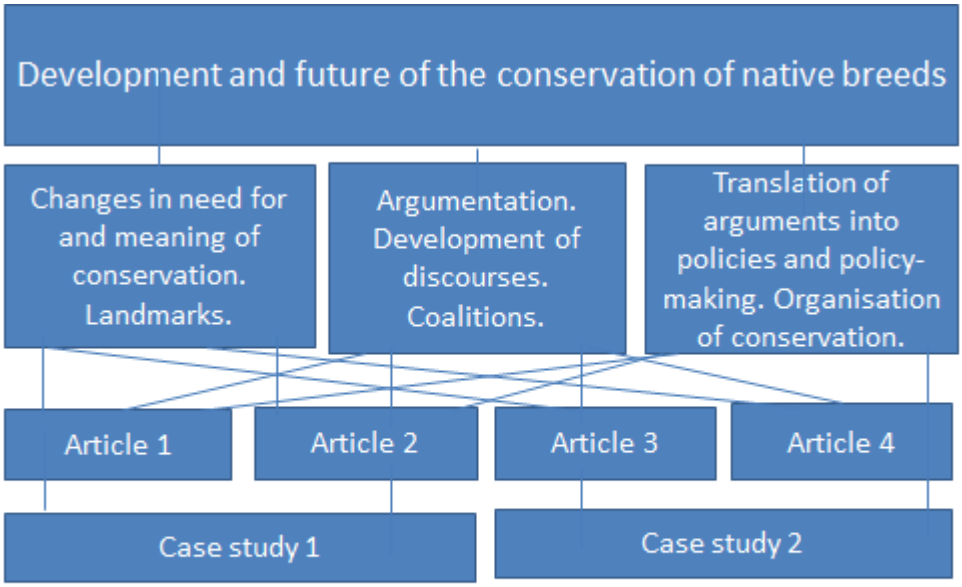

Figure 1 Research theme, main research questions, role of articles and case studies.

3 THEORETICAL FRAMEWORK

3.1 Research setting

In the following, the theoretical framework of the study, i.e. the three approaches used in this thesis are presented. They form a research setting for analysing the conservation of Yakutian Cattle in Sakha and of native breeds in Finland. First, environmental governance deals with institutions, actors and contents that affect policies and practices of the conservation (Kooiman, 2003; Driessen et al., 2012). Second, ecosystem services for their part are about the benefits ecosystems produce for the well-being of humans, and also the values underlying the services (Haines-Young & Potschin, 2010; Chan et al., 2012). Third, the institutional approach used in this study contributes to the questions of environmental governance and ecosystem services by analysing the realisation of policies (Hajer, 2003; Hiedanpää & Bromley, 2016). These approaches provide three complementary perspectives on understanding the conservation of native breeds, as well as its development and future.

In Figure 2, the main purpose of each approach is introduced. The arrows reflect phases of the research process: first, environmental governance identifies actors, institutions and contents of policy; second, ecosystem services reveal related benefits and values; third, the institutional approach shows the realisation of policies in practice. Each of these approaches contributes to answering the main research questions: what changes there are in the need for conservation and its meaning over time and what landmarks can be identified; what the arguments are for conservation expressed by different actors and institutions, how discourses have developed and what kinds of coalitions are formed; and finally, how different arguments are translated into policies and policy-making and how the conservation is organised. The environmental governance approach was used in both case studies and this summary essay; ecosystem services were introduced in the second case study and also used in this summary essay; the results of both case studies were further elaborated with the institutional approach in this summary essay.

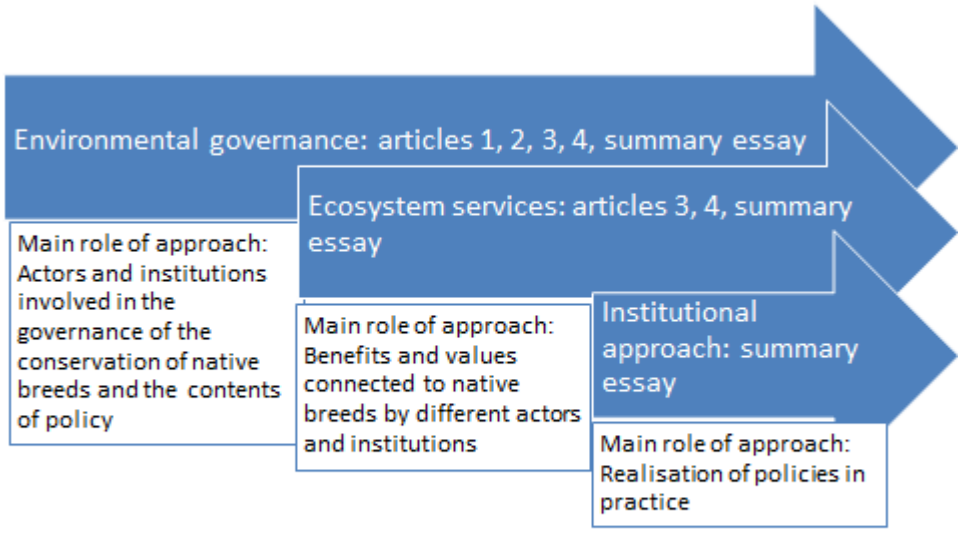

Figure 2 Three approaches used and their main roles in the thesis.

3.2 Environmental governance

The concept of governance is often used in policy research but there is confusion and disagreement about its exact definition. Stoker (1998) identifies the key aspects of governance as: 1) a set of institutions and actors drawn from and beyond government; 2) a blurring of boundaries and responsibilities for tackling social and economic issues; 3) power dependence in relationships between institutions; 4) autonomous self-organising networks; 5) governing by the use of new techniques to steer and guide rather than command. Since the institutions and actors are not only from but beyond government, questions of legitimacy are essential for governance to be successful. There are several institutions and actors and their networks with blurred responsibilities involved, which contributes to problems with accountability, and increases the risk of unintended consequences. Thus, governance implies a greater willingness to cope with uncertainty and open-endedness. Failures may occur even if governments operate in a flexible way to steer collective action in governance (Stoker, 1998).

Colebatch (2014) has criticised the use of governance as implying both certain forms of governance and the governance process itself. He further suggests that instead of arguing over the exact concept, governance should be taken as an analytic construct. It can recognise specific social phenomena and thus contribute to the understanding of observed practice. In other words, the field of practice should be the starting point. It should be studied, how the participants try to order their practice, and to what extent this includes recognising or constituting or deferring to explicit agencies of order. The relationship between these agencies and the machinery of government are important points of study. It is necessary to understand that governing is not only about specific actions and structures, but also about the shared meanings and contexts, and the recognition of the persons and processes which constitute these contexts. In the analysis suggested by Colebatch (2014) three overlapping and interacting accounts are recognised: 1) authoritative choice, focusing on the structures and practices of legitimate authority; 2) structured interaction, focusing on the interplay between different organised participants; 3) social construction, focusing on the framing of what is to be governed, what constitutes valid knowledge, what are shared values, and who can speak with authority.

The concept is also widely used in environmental policy, and the discussion about the definition and use of environmental governance is multiple. A general definition is that environmental governance deals with the management of environmental problems and their solutions in society (Sairinen, 2009). The focus of environmental governance has shifted from hierarchical governance, characterised by state intervention and top-down policies, towards decentralised bottom-up approaches (Holley et al., 2012; Kooiman, 2003). Hierarchical governance is a traditional form of governance, based on state control and command. It has been criticised for its insensitiveness towards local conditions, which has made it ineffective. Alternative, less centralised, more inclusive and less autocratic forms of governance have become more desirable during the past decades (Holley et al., 2012). It should be noted that the phenomena cannot be called new as such. There have always been forms of governance to respond to different practical problems without state intervention at the implementation level (Colebatch, 2014). These forms of environmental governance include e.g. co-governance that consists of cooperation and interaction among different actors and levels, and self-governance in which different actors take care of themselves without state intervention (Kooiman, 2003).

Driessen et al. (2012) have developed the classification further and distinguished five different forms of governance: 1) centralised governance; 2) decentralised governance; 3) public-private governance; 4) interactive governance; and 5) self-governance. Thus, there are different ways to classify the forms of governance that comprise of: a) actor features (key public actors that initiate action and specify the environmental issues in policy ambitions; position of other stakeholders; predominant policy level at which key actors operate; formal and/or informal basis of power of the key actors); b) institutional features (model of representation; formal and/or informal rules of exchange and interaction; mechanisms of social interaction); and finally c) features concerning policy content (types of intentions that are pursued; policy instruments that are predominantly used for policy implementation; the types of knowledge used for policy preparation, decision-making, implementation and evaluation, and the extent to which policies are integrated or not) (Driessen et al., 2012). For the purposes of this thesis, it is relevant to understand that the case studies represent two initially different forms of governance, which have evolved over the course of time. They need to be identified to the extent that it is possible to understand the development and future of the conservation of native breeds in both contexts.

Regarding the process of governance, the conservation of biodiversity has new characteristics due to globalisation. Globalisation in general has accelerated the loss of biodiversity. Yet, due to globalisation, new institutions and actors have emerged in biodiversity conservation. Globalisation has also made the management of biodiversity conservation, including information sharing, monitoring and conservation strategies more global (Zimmerer, 2006). Global environmental governance is increasingly segmented into different layers and clusters of rule-making and implementation both vertically and horizontally. Vertically it is a question of multilevel governance: supranational, international, national and subnational layers of authority, and horizontally of multipolar governance: among different parallel rule-making systems maintained by different groups of actors (Biermann & Pattberg, 2012). Thus, it is becoming more and more important to acknowledge that conservation is taking place on different scales (Zimmerer, 2006). Usually the problem associated with environmental conservation is that the scales of the environmental problem and the solutions do not meet (Kaljonen, 2011). It is necessary to analyse and identify the distinct areas where the environmental problem occurs, how it is negotiated and the solution implemented (Zimmerer, 2006).

In order to improve policy implementation and to achieve more sustainable policies, collaborative and participatory decision-making on multiple governance levels has currently been enhanced in environmental policies (Newig & Fritsch, 2009). The conservation of indigenous breeds requires more information on how and by whom the conservation should be governed, and what the conditions are for different types of conservation and partnership building on different levels of conservation. At its best, governance may facilitate learning and adaptation in complex socio-ecological systems, where conservation is strongly linked to local development (Armitage, 2007). Environmental governance involves the clear articulation of values, the identification of intentions, and the negotiation of environmental management plans. This is required to carry out conservation plans (Sampford, 2002). These ideas of environmental governance emphasise the importance of networks, their formation and functions in order to improve interaction and communication, and to reconcile different perceptions and intentions. The obvious aim is to create a feasible model of good environmental governance. Yet, these governance models are theoretical, not necessarily emerging from empirical data, but elaborating an ideal of environmental governance. There is a notable risk that comparing reality to these theoretical models may lead to a bias, in which reality is subordinate to ideals (Sairinen, 2009).

Another challenge with the environmental governance approach in this thesis has to do with the concept of change. The need for and meaning of conservation has changed over time, which can be seen in the different milestones in the development of the conservation of native breeds. Yet, transitional models typically consist of a polarised comparison between the new and the old. Consequently, the models tend to overemphasise the current phenomena and to pay less attention to the multi-layered nature of change and the interaction between these layers. The realisation of some changes takes more time than that of others, and it is often the more fundamental elements of society that need more time to change. Thus, there is a risk that change is interpreted too much in terms of today and the elements that are in a hegemonic position today (Kerkelä, 2004).

In this thesis, it is understood that the conservation of native breeds in both case studies differs to a large extent from the ideal models of environmental governance. The main purpose of the environmental governance approach is to help identify the actors and institutions engaged in the conservation of native breeds on different levels and sectors of conservation, as well as their agencies, e.g. their influence on decision-making concerning conservation and its contents. Furthermore, the approach helps to understand the policy changes that have led to

the organisation of conservation, and to elaborate how it could change in the future. The change is analysed in a wider socio-historical context to avoid the risks of biases. Hence, environmental governance provides a relevant approach to the purposes of this thesis despite its weaknesses. Yet, recognising the different levels and sectors of multi-level and multi-polar governance, as well as institutions, actors and their agencies affecting conservation, is only the first step to explore how and why conservation is organised in its current form and how it could be improved.

3.3 Ecosystem services

Ecosystem Services (ES) are the benefits people obtain from ecosystems for their wellbeing (MA, 2005) that contribute to making human life both possible and worth living (UK-NEA, 2016). In addition to basic needs, such as food and shelter, the benefits include the realisation of higher aspirations, such as art and recreation (Hoffmann et al., 2014).

There are various ways to categorise ES. The Millennium Ecosystem Assessment (MA, 2005) classifies ecosystem services in four categories: provisioning services, cultural services, regulating services and supporting services. Provisioning services provide material outputs, such as animals and crops, seeds or embryos from ecosystems. They are tangible commodities which can be traded, directly consumed or used in food processing. Cultural ecosystem services (CES) are non-material benefits, such as aesthetic or recreational enjoyment. Regulating services are environmental processes or ecosystem functions, such as pest control and pollination. Supporting services include e.g. photosynthesis, or the supply of manure and grazing to create or maintain specific habitats for wild plants and animals. They are necessary for the production of all other ecosystem services. The classification of ES has been further developed since the introduction of the MA. The Economics of Ecosystems and Biodiversity (TEEB) initiative replaced supporting services with a new category of 'habitat services', whereas the Common International Classification of Ecosystem Services (CICES) introduced a hierarchical classification of ES: provisioning, regulating and maintenance and cultural service themes and below them several classes of service (TEEB, 2016; CICES, 2013; Haines-Young & Potschin, 2010).

The relationship between ES and biodiversity is complex, and has been studied in research. In some cases, biodiversity and ecosystem services are regarded as synonyms, in other cases biodiversity is seen as an ecosystem service itself. The

former stresses the perspective of ecosystem services and the latter that of conservation (Mace et al., 2012). Since the concept of ecosystem services is based on the dependence of humans on its environment, biodiversity can also be seen as a precondition for ecosystem services (Hoffmann et al., 2014). According to Mace et al. (2012), biodiversity has key roles at all levels of the ecosystem service hierarchy: as a regulator of underpinning ecosystem processes (such as microorganisms in decomposition and the nutrient cycle or pollinators in the stability of non-agricultural ecosystems); as a final ecosystem service (wild crop and livestock relatives ensuring genetic diversity to provide the resilience of food production systems against future climate change or diseases or pollinators as security for many food crops) and as a commodity which is subject to valuation, whether economic or otherwise (animals recognised for their charisma or aesthetic appeal; endangered species maintaining taxonomic diversity). One of the aims of ES is to promote biodiversity, which makes it appealing also in respect to the conservation of native breeds. However, it should be noted that since biodiversity and ecosystem services are not synonyms (Mace et al., 2012; CBD, 1992; UK-NEA, 2016), conflicts and trade-offs that threaten biodiversity are possible when certain ES are favoured over others, e.g., in PES (payment for ecosystem services) and other agro-environmental support schemes (AES) (Bullock et al., 2011). In this sense, it is important to understand the difference between these two concepts.

The ES approach has been criticised for a wide range of reasons. The criticism aims to improve the approach or even to question its feasibility. One of the points of criticism concerns the spatiality of ecosystem services that has not been sufficiently considered in the current ES frameworks. This criticism contains the idea that the ES framework should be able to analyse how global or proximity-dependent the ES are, in which locations ES are produced, and where their users are located (Haines-Young & Potschin, 2010). Moreover, the incorporation of cultural ecosystem services (CES) into the assessment of ES has been methodologically challenging, because of their intangible nature (Satz et al., 2013). The spatially and temporally changing processes, and individual and collective valuations included in CES have even led to questioning whether CES can be analysed with the ES concept (Pröpper & Haupts, 2014; Winthrop, 2014). The ES concept is further criticised for focusing on economic valuation instead of biodiversity conservation (Schröter et al., 2014). Spangenberg & Settele (2010) stress that economic instruments may be helpful in safeguarding ecosystems and the services they provide, but economic analysis is not an adequate method to determine the objectives or priorities of conservation policies. Therefore,

economic instruments should not be regarded as target setting mechanisms but as tools to contribute to the implementation process of a certain target. Furthermore, the ES is considered an instrumental, anthropocentric and utilitarian concept (Schröter et al., 2014), the identification of which is dependent on the context and human activities and wants (Boyd & Banzhaf, 2007).

Thus, the discussion on the definition, classification and use of ES is constantly expanding and changing. In this thesis, the most essential aspect of ES is that the concept provides a new perspective for the conservation of biodiversity. Because attempts to conserve biodiversity based on its intrinsic value and science have in general not been successful, the conservation of biodiversity is increasingly justified with ES (Primmer et al., 2015; Haines-Young & Potschin, 2010; see also Jarvis et al., 2007). ES recognise humans as beneficiaries of nature and stress the link between human development and environmental challenges (Primmer et al., 2015; Hoffmann et al., 2014), which provides arguments for the conservation of biodiversity. In this sense, ES helps to interpret and communicate the interactions between humanity and nature, although potentially oversimplifying them (Bull et al., 2016). These arguments do not automatically become practice in policy implementations (Primmer et al., 2015; Bull et al., 2016), nevertheless, the ES framework has the potential to communicate between research and practice (Bull et al., 2016).

In this thesis, the ES framework is used to reveal how different actors and institutions recognise and emphasise benefits and values related to native breeds. The aim of this analysis is not to assess ecosystem services provided by native breeds but to use the ES framework as a tool to identify services, benefits and values obtained from and related to landraces, and to further analyse them in a conservation context. Benefits are here understood as valued goods and experiences. Services are the ecosystem processes underpinning benefits. Values are the preferences, principles and virtues that people hold as individuals or groups (see Chan et al., 2012). The ES approach contributes to the knowledge gained from the environmental governance approach, and helps to recognise and identify arguments and reasons behind the decision-making processes. In the Finnish case, the ES approach is used to inquire how stakeholders who are active on different levels and in varied sectors of conservation perceive native breeds. The ecosystem services and benefits obtained from the Yakutian Cattle or values related to the breed are not dealt with in the articles, although they can be identified with respect to the results from the case of native breeds conservation in Finland.

3.4 Institutional approach

Institutions are usually seen as conventions, norms and rules of a certain society or community. They are either formal institutions, such as associations, states and international communities, or informal institutions, consisting of habits, routines and traditions of a group. In other words, institutions consist of collective action that can expand, restraint and liberate individual action (see e.g. Vatn, 2005; Hiedanpää, 2005). Existing formal and informal institutions play a decisive role in the implementation of new institutions, such as the use of new administrative, economic, informative, and contractual policy instruments (Hiedanpää et al., 2017; Hiedanpää & Bromley, 2016), which is relevant to analysing policy success. Moreover, several administrative sectors with their own policies and policy instruments are involved in the governance of natural resources. In practice, it is difficult for actors to take into account and carry out policy measures from different policy sectors at the same time (Hiedanpää et al., 2017).

The concept of institutional fit is concerned with the ability of institutions to respond effectively to environmental challenges including the dynamics of interplay and scale. Institutions interact both with one another and with the biophysical environment, and lessons from the study of local institutions can be drawn upon for the study of global institutions and vice versa (Young, 2002; 2003). The concept of institutional fit has been criticised especially for its tendency to regard institutions as solutions and ecosystems as problems. Institutional fit should be considered a matter of embodied and incorporated environmental interactions (Hiedanpää, 2013). The concept of institutional ambiguity takes one step further in problematising the state of affairs. It is comprised of the idea that policy-making often takes place in a situation where there are no generally accepted rules and norms, according to which politics are to be conducted and policy measures are to be agreed upon (Hajer, 2003).

There is some ambiguity regarding rules in all political systems, and there will always be some actors who do not accept the validity of the rules, or that of the powerholders. However, the blurring of responsibilities and boundaries in policy-making can create uncertainty and even an ambiguity (Stoker, 1998). It is sometimes the case that, due to their lack of power, established institutional arrangements cannot deliver the required policy results without the help of other institutions (Hajer, 2003). Organisations that are committed to collective action are dependent on other organisations, and need to exchange resources and negotiate common purposes to achieve goals. The outcome of this exchange does not

depend on the resources of the participants alone but also on the rules of the game and the context of the exchange (Stoker, 1998). The problem with institutional ambiguity is that there may be a game without rules, and therefore the required policy results are difficult, if not impossible, to achieve. In other words, there is a gap between the existing institutional order and the actual practice of policy-making. The lack of power of political institutions to deliver required policy results on their own leads to the need for new institutions, practices and systems (Hajer, 2003). In a sense, governance means living with uncertainty and designing institutions in a way that recognises both the potential and the limitations of human knowledge and understanding (Stoker, 1998).

Although institutional ambiguity is based on the idea of the weakening of nation states, it does not imply that state-institutions and international treaties have ceased to exist or can be interpreted as meaningless. Instead it argues that there are important policy problems for which political action takes place next to or across such orders. This state of affairs challenges the rules and norms of the participants (Hajer, 2003). Colebatch (2014) stresses that there has not necessarily occurred any shift from government to governance but that multiple actors, institutions and networks have always existed and have always sought solutions to practical problems without clear rules or state interventions.

Formally the conservation of biodiversity is in the hands of the parties that have signed and ratified international agreements beginning with the Rio Convention (1992), that is, in the hands of nation states. Finland and Russia have ratified international agreements concerning the conservation of agrobiodiversity. In the case of the Yakutian Cattle, the Russian Federation has further delegated the formal legislation and conservation to the Sakha Republic. Finland for its part is a Member State of the EU, and therefore Finnish agriculture has to comply with the Common Agricultural Policy (CAP). Regarding the conservation of agrobiodiversity, the EU measures involve co-ordination between Member States and between the Member States and the European Commission. They also facilitate co-ordination within the UN Convention on Biological Diversity. Thus, there is supranational regulation that affects the conservation of native breeds by setting frameworks and allocating funding to agriculture and rural areas.

In Finland, biodiversity conservation is in the hands of the Ministry of the Environment with some exceptions, such as agrobiodiversity which come under the administration of the Ministry of Agriculture and Forestry. This is also the case in the conservation of native breeds where administration is divided between ministries that have different targets in their conservation policies: conservation of

biodiversity is part of the work of the Ministry of the Environment, whereas the rural livelihoods and the conservation of native breeds are under the remit of the Ministry of Agriculture and Forestry.

The institutional approach used in this thesis helps to understand how conservation could be improved by stressing the points where the practical realisation of conservation does not take place in the intended way, and why this is happening. It underlines the problems of not having generally accepted rules and norms, and thus emphasises the need to agree upon common goals and ways of achieving them. The use of this approach is somewhat different in the case studies. The first case study concerns a conservation context with a long tradition of top-down policies. The second case study deals with a more modern society aiming to shift towards less hierarchical forms of governance. It can be questioned whether the concept of institutional ambiguity is applicable in the first case study of this thesis. The framework is intended to analyse modern societies where the shift from top-down policies to more multiple forms of governance has occurred or is at least in process. Yanitsky (2012) describes the activities of the Russian environmental movement as a fight for a shift from government to governance, from top-down rule to self-organisation and for the right to take part in decision-making (see also Yanitsky, 2001). Yet, in this thesis the institutional approach is used to reveal the gap between policy intentions and their realisation, and thus the approach is feasible. Even in the top-down context, certain actors, institutions and policy contents can be identified and used in elaborating the conservation from the institutional approach point of view.

4 DATA AND METHODS

4.1 Case study

The idea of a case study is to research the particularity and complexity of a single case and to understand it in its context (Stake, 1995). The case study method is used in this thesis to elaborate the conservation of native breeds in two cases. The aim of this study is not to be comparative in nature but to demonstrate two cases of conservation and its development. The case studies were researched separately and they concern different conservation contexts. There are nevertheless some points of comparison that can and have to be made. According to Yin (1994), a comparative study looks at the same issues several times from different points of view, which is the level of comparison provided by this thesis. The study provides a special insight into time and its ramifications and helps to illuminate how the conservation processes work on a more general level (see Feagin et al., 1991).

Different types of case studies have been identified by research (Tellis, 1997). Yin (1994) distinguishes between exploratory, explanatory and descriptive case studies. Exploratory cases are initial in nature and are often considered as a prelude to further research. They are conducted for a problem that has not been clearly defined. They start with collecting data on a particular issue. Descriptive cases take one step forward, and require a descriptive theory to be developed before starting the project. They aim to obtain information on the particular features of an issue. Explanatory case studies are further developed and try to explain and analyse why and how something has happened. Therefore, they may be used for making causal investigations. Furthermore, Stake (1995) identifies three different types of case studies: intrinsic, instrumental and collective. Intrinsic case studies refer to the case being interesting *per se*, whereas in an instrumental case study the research is used to understand more than is obvious to the observer. The collective type of case study concerns research where the aim is to study a larger group of cases (see also Tellis, 1997).

The case study approach has been criticised for several reasons. The main criticism focuses on the generalisation, summarising and development of general propositions and theories on the basis of specific case studies (Flyvjberg, 2006).

However, an empirical, context-dependent case study research method may prove to be more valuable in understanding unique phenomena than hypotheses based on predictive theories and universals. Empiric and theoretical emphases in research may also serve different purposes, i.e. a case study can be used as a supplement or alternative to other methods (see e.g. Flyvjberg, 2006; Peuhkuri, 2007). The purpose of a case study is not only to understand a phenomenon but also to provide tools to negotiate how phenomena could and should be understood, studied and approached (Peltola, 2007). The aim of the case study approach is to reveal the eventuated motives of actors in specific decisions and events, that is, to discover complex sets of decisions and recount the effect of these decisions over time (Feagin et al., 1991; see also Yin, 1994; Stake, 1995).

The two cases of this thesis are intrinsic: they were studied and analysed independently in their own right. However, they also contain features of instrumental case studies as they provide means to understand how the conservation of native breeds has developed in two different cases. Coming to the distinction made by Yin (1994), the Sakha case study started as exploratory research, the results of which are presented in the first article of this thesis (I). The case study subsequently further developed into descriptive research (II). The Finnish case study was conducted chronologically after the Sakha case, and was thus able to use the results of the previous case and was descriptive to begin with (III, IV).

The first case study of this thesis is the conservation of the Yakutian Cattle that live in the northern part of the Sakha Republic, in the Russian Far East. The population of about 1,200 head of Yakutian Cattle (as in 2006) exist mostly in the Eveno-Bytantay district, in three villages, Batagay-Alyta (Sakkyryr), Kustur and Dzhargalakh, which are located above the Arctic Circle, approximately 1,000 kilometres to the north of the capital of the republic, Yakutsk. The district is officially dedicated to the reindeer-herding indigenous people of Eveny. However, it is the only district where the Yakutian Cattle, the indigenous breed of the Sakha people has survived. There are no other breeds in production in the district. Although the Sakha people are a minority in the Russian Federation, they form the majority of the population in the Sakha Republic (Granberg et al., 2009). Since the collapse of the Soviet Union most of the cattle are privately owned. The rest are located in the state-owned enterprise Bytantay (until 2005, Yakutsky skot) that keeps Yakutian Cattle in the villages of Kustur and Batagay-Alyta. Another state-owned farm for research work is located in a village in the Gorny district in Uluu-Syhyy near Yakutsk, and has operated since the mid-1990s (I, II).

The Yakutian Cattle have important features, such as resistance to certain diseases and the ability to survive in cold and dry conditions with poor feeding. The reason for this feature is that the cattle have adjusted to demanding circumstances over the course of time. These valuable features make the cattle significant not only for the maintenance of cattle husbandry in the native northern territories, but also for agriculture on a global scale. Recent research has revealed the genetic value of the Yakutian Cattle, which are the only surviving cattle originating from the Siberian Cattle (Granberg et al., 2009).

The second case study of this thesis is the conservation of native breeds in Finland. There are indigenous cattle, sheep, goat, chicken, bees and horse breeds still in production in Finland. Some of them are classified as endangered, while others are not at risk. The endangered animal breeds are maintained, and kept *ex situ* in gene banks, as well as *in situ* as living populations. The *ex situ* conservation is organised by the state, and there is Nordic cooperation in the field. The *in situ* conservation is organised by the state, NGOs and private farmers. There are indigenous breeds in some prisons and educational establishments, as well as on farms in primary production or as part of other business activities such as recreation and tourism. The government supports farmers who keep indigenous breeds through specific agro-environmental schemes (AES) (Karja & Lilja, 2007), i.e. environmental agreements.

In the following, an estimation of the numbers of native breeds in Finland is given. It should be noted that the numbers vary somewhat according to the source and depending on how pure-bred and old animals are included. Therefore, the following numbers aim to give an overview of the proportion of landraces in all livestock. According to the latest statistics by Luke (2017) the number of Finncattle amounts to 3,920 breeding females (Eastern Finncattle 1,600, Western Finncattle 1,500, Northern Finncattle 820), i.e. approximately 1-2 % of all cattle are indigenous in Finland. Moreover, there are 11,660 Finnsheep; 1,200 Åland Sheep and 750 Kainuu Grey Sheep ewes in Finland, which makes up approximately 20% of the total number of ewes. Furthermore, 20,000 Finnhorses constitute one third of the total number of horses in Finland. Approximately 5,000 Finnchickens and –roosters (0.15%) are kept by registered farmers in Finland, mainly for domestic use. Contrary to other native breeds, Finngoats with 7,000 animals are the only goat breed in production in Finland. There are also a few hundred native bee colonies in Finland that have mainly been replaced by other breeds (Luke, 2017).

4.2 Interviews, media representations and documents

In the first case study, the research material consists of various documents and literature on the history of Russia and in particular of Siberia, as well as the modernisation of agriculture and emergence of awareness related to native breeds. Coeval literature written by scholars who were engaged in the conservation of Yakutian Cattle already during the Soviet era is used as research material. In addition, there are political programmes and laws enacted by the United Nations, the Soviet Union, the Russian Federation and the Yakut ASSR or the Sakha Republic, as well as 71 interviews. The interviewees were chosen to represent different levels and sectors of conservation organised according to a governance approach.

The interviews were classified in three distinct groups. First, there are local residents, who either have their own farm or work on a state farm. They have lots of experiential, traditional or local knowledge related to the cattle husbandry. Other residents, who work in other occupations and do not have any cattle themselves are also included in the first group of interviewees. In the second group, there are specialists and experts in local administration and in cattle breeding, production or research. They are referred to as local certified experts, whose main concern is how to arrange and enhance cattle husbandry in the area and to meet all the technological, financial and social requirements, and also conduct the scientific experiments required by the republic. The third group includes researchers, politicians and administrators in the capital city Yakutsk. They perceive the issue from the republic, and an even wider point of view, but are not necessarily very familiar with the realities of the three distant villages in which the cattle breed is kept.

The interviews were carried out with a questionnaire and thematic interviews including the following topics: 1) Agriculture and cattle husbandry in the Sakha Republic; 2) the past and current state of the conservation of Yakutian Cattle; and 3) the future of remote rural areas in the Russian North. The interviews were conducted in Russian and translated into English or Finnish. Additionally, newspaper articles published by two Sakha newspapers from 2003-2005 were analysed. These were the Yakutia (Y) published in Russian and Sakha Sire (SS) published in Sakha and translated into Russian by local students. The research material includes newspaper articles dealing with the Yakutian Cattle and the current development of traditional agricultural livelihoods in the Sakha Republic (I, II). The interviews and media representations were examined by discourse analysis.

In the second case study, the main research data was collected through stakeholder interviews. Other research material consists of previous literature and published policy documents, such as material from Finland's National Animal Genetic Resources Programme, the Nordic Genetic Resource Centre (NordGen)[6] , and the United Nations /FAO, including the Commission on Genetic Resources for Food and Agriculture[7], the Convention on Biological Diversity (1992) and the Nagoya Protocol (2010).

The interviewees comprised 1) a representative of the Ministry of Environment, a member of the Finnish National Advisory Board for Genetic Resources; 2) a representative of the Farm Advisory Centres; 3) a representative of the Finnish Animal Breeding Association (FABA), a member of the Finnish National Advisory Board for Genetic Resources; 4) a representative of the Central Union of Agricultural Producers and Forest Owners (Farmers' Union); 5 & 6) two representatives of a vocational school for agriculture; 7) a representative of a vocational school for agriculture and a foundation for promoting urban-rural interaction, a member of the Finnish Animal Breeding Association; 8) a representative of the Finnish Landrace Association; and 9) a representative of a cooperative producing meat and milk products of local breeds.

The interviews were conducted using a questionnaire that was completed with thematic interviews addressing the following topics: the status of native breeds and conservation criteria in Finland; governance instruments of native breed conservation; conservation of native breeds and their organisation; and the sustainable use of native breeds and their organisation. The stakeholders represented agricultural and environmental administration, education, research and NGOs, as well as private entrepreneurs engaged with indigenous farm animals at different levels of production. The interviews were analysed using qualitative measures: i.e. discourse analysis with a storyline concept. The stakeholders were chosen from the decision-making chain arising from the governance approach. The stakeholder opinions are important to the conservation of indigenous breeds, because they combine the implementation level opinions with the larger goals of

[6] The Nordic Genetic Resource Center (NordGen) is a Nordic organisation dedicated to the safeguarding and sustainable use of plants, farm animals and forests. NordGen is mainly financed by the Nordic Council of Ministers. (www.nordgen.org)

[7] The Commission on Genetic Resources for Food and Agriculture offers a permanent forum where members work to raise international awareness of the erosion of genetic resources and to spur policy efforts related to biodiversity for food and agriculture. Membership is open to all FAO Members and Associate Members. (www.fao.org/nr/cgrfa/cgrfa-home/en/)

conservation, taking into account the frameworks within which the conservation can be organised (III, IV).

A general problem with the research material concerning Russia has been lack of archive materials that could have enabled a deeper analysis of both the reasons and the levels and sectors at which decisions concerning the conservation of the Yakutian Cattle have been made. I have aimed to solve the problem caused by the lack of archive materials by emphasising the role of interviews and published documents to inquire into the arguments regarding the conservation of the cattle. I have aimed to establish a coherent picture and provide answers to the research questions on the basis of available research material, including interviews, published documents, media representations and previously published literature. The case of the conservation of Yakutian Cattle covers a time period from the 1950s until 2006.

In the Finnish case study, the number of stakeholder interviews was small consisting of ten stakeholders with altogether nine interviewees. However, they represented important institutions on different levels and sectors of conservation of native breeds in Finland. Therefore, the research material can be considered encompassing for the purposes of this thesis. It completes the picture of the conservation of native breeds, in addition to published policy documents and previous literature available. The case of the conservation of native breeds in Finland covers a time period from 2011 until 2016.

4.3 Discourse analysis

The interviews and media representations of both case studies were interpreted with discourse analysis. Several definitions of what discourse and discourse analysis are can be found in the literature regarding research methods (Pietikäinen & Mäntynen, 2009; Jokinen et al., 2006). In social sciences, the definitions of discourse analysis usually have in common the idea that language has linguistic, discursive and social aspects (Pynnönen, 2013). Language is not a neutral reflection of the world, identities or social relations, rather it maintains and changes them at the same time (Jorgensen & Phillips, 2002). Discourse analysis is, thus, a method that studies language and its use, and thereby the surrounding society, culture, time and space (Pynnönen, 2013). Consequently, with discourse analysis it is possible to analyse what language does, i.e. how language affects one's attitudes and understanding, and how it delivers power (Hajer, 2006).

In this study, it is relevant to understand that there are certain regularities in language which have the capacity to shape the world, or as in this context, affect policies and practices of conservation. These regularities or structures are called discourses: an ensemble of ideas, concepts, and categories. Discourses are produced and reproduced through a recognisable set of practices, and at the same time they themselves give meaning to social and physical phenomena. Practices consist of the sites in which language is used (Hajer, 2006; 2016). Analysing these sites, that is, the discursive practices and contexts in which language is used, enables the elaboration of the maintenance and transformation of discourses (Jorgensen & Phillips, 2002). In cases where many people use a specific discourse to conceptualise the world, and if the discourse is incorporated into institutions and organisational practices, it can become a hegemonic discourse that dominates discussions within its field (Hajer, 2006; 2016).

The interaction and power relations between actors and institutions in societies, and the way they are reflected and created by the use of language in social practice are of particular interest to many scholars in the field of social sciences. Yet, there are different views concerning the perception of whether power relations are a consequence of language or vice versa (Hewitt, 2009). Critical Discourse Analysis (CDA) focuses on linguistics tradition, and thus studies the social practices in language (e.g. van Dijk, 1993). Other approaches concentrate on discursive traditions and stress that social practices have to be studied beyond units of texts (e.g. Hajer, 1993; see also Hewitt, 2009). In this thesis, a more discursive tradition of analysis was followed, acknowledging that methodological choices regarding discourse analysis are case-dependent. These are relational to the knowledge and discourse practices found in research (Hewitt, 2009).

The storyline concept is used in the case study concerning the conservation of native breeds in Finland. Storylines are generative narratives that structure and re-order the meanings of discourse. In storylines certain discursive categories, ideas or concepts are used to give meaning to particular physical or social phenomena. Storylines are formed within a discourse, and can be seen as semiotic tools that make the discourse more understandable (Hajer, 1993; 2005). Thus, storylines are based on narratives. In this thesis, the narratives consist of the perceptions of interviewed actors about the aim of the conservation of native breeds, and about how and by whom conservation should be carried out and why. These perceptions form storylines. A storyline can be seen as a method for the creation and maintenance of meanings, and a specific way of constructing a problem (Hajer, 1993; 2005; see also Lyons, 2013). It is possible that different actors contribute to

several storylines within a discourse. In this thesis, the storylines are discussed with reference to the institutions that the interviewed actors represent.

Discourse coalitions consist of groups of actors sharing the usage of a specific set of storylines; over a specific time period; in the context of a recognisable set of practices. Discourse coalitions are formed between actors that see a policy to be problematic in a particular way. They express the same storylines or tend to argue in a similar way. The discourse coalition concept illustrates why a particular network is established and what keeps it together. It concerns shared discourses and perceptions among various actors. These discourse coalitions struggle for hegemony and legitimacy, i.e. they aim to persuade other actors to share their view on what a policy problem is and how it should be solved (Hajer, 1993; 2016; see also Lyons, 2013).

In this thesis, policy discourses, discourse coalitions, discursive struggles and institutional practices in which discourses are produced are analysed in both case studies. In particular, the interviews and media representations collected in the first case study do not only reveal how the conservation being studied has developed and is organised, but also how people remember and believe it to have developed, in addition to how, why and by whom the different arguments were expressed. Therefore, in the case of the conservation of Yakutian Cattle, the actions and controversies are also elaborated in socio-historical contexts. In the second case, the use of language is especially important in determining the ecosystem services, benefits and values that different actors identify in native breeds, and different preferences in conservation. However, it should be noted that discourse analysis is interpretive by nature. Therefore, the analyses are never complete but aim to provide an interpretation of how people use language to create and to reflect the world (Pynnönen, 2013).

5 RESULTS

5.1 Changes in policy

The first research question of this thesis concerns the changes in policy: How has the need for and meaning of conservation changed over time? What different landmarks can be identified in the development of conservation? The first case study (I, II) highlights the international efforts in conserving native breeds and is used to show how they were transformed into practical policies. The case study concerning the conservation of the Yakutian Cattle started as a piece of exploratory research, the results of which are presented in the first article of this thesis (I). The case study further developed into a descriptive piece of research on how the studied area of conservation was intertwined with the lives of the people keeping the cattle (II). In the following, I will first present the results from the first case study and then reflect on them with regard to the case of the conservation of native breeds in Finland.

The replacement of Yakutian Cattle with better-yielding animals as part of the modernisation and intensification of agriculture gradually reduced the numbers of a breed that had earlier been the main breed in the Sakha area (Granberg et al., 2009). Already by the late 1950s, the Yakutian Cattle existed only in the remote northern territories, where the transport connections were poor and distances long, and where they still exist today (I). The Soviet agricultural policies, first the collectivisation and then the enlargement of kolkhozes, together with all the re-arrangements they brought about, had increased the level of hierarchical governance (II) in the management of the Yakutian Cattle. There were, however, counter-arguments against the complete destruction of the local Siberian cattle breed, in particular from the scientific community. Despite the fact that they did not receive wide publicity or acceptance during the most significant years of modernisation, the times were set to change also regarding cattle-breeding and other agricultural activities (I).

In the 1950s and 1960s many researchers and authorities in the Soviet Union were in favour of crossbreeding and there were plans to replace the Yakutian Cattle with better-yielding animals. Yet, some of the scientists in Yakutsk, Moscow and in

the All-Union Research Institute of Farm Animal Breeding and Genetics in Leningrad criticised the ongoing politics and wanted to study the genetic resources of the Yakutian Cattle (I). Additionally, globally the loss of AnGR, especially in developing countries, was worrying scientists. The first milestone in the conservation of landraces was reached in the 1970s, as the FAO and the United Nations Environment Programme (UNEP) launched a joint project titled "Conservation of animal genetic resources" that aimed to prepare lists of farm animal breeds that were threatened by extinction, and to determine possible measures that had been recommended or already carried out to prevent extinction. Genetics researchers in the USSR leveraged international efforts in the conservation of AnGR to legitimise the conservation of the Yakutian Cattle. There were challenges in the modernisation of Soviet agriculture, which contributed to the development of the conservation in the Yakut ASSR starting from the mid-1970s. The poor state of animal-breeding and production numbers in agriculture helped to shift the focus from mere production volumes to the use of new technologies. The efforts of some research scientists to study and conserve the indigenous and lower-yielding Yakutian Cattle started gradually to pay dividends (I).

At the same time, the loss of biodiversity emerged on the policy agenda around the globe. A Consultation Report to review the work achieved by the joint project of the FAO and UNEP followed and made recommendations for future action. The first concrete steps in conservation, such as collecting genetic material, took place in the 1980s, and the policy found more support after the collapse of the Soviet Union (I). In the early 1990s the loss of AnGR received its final recognition as a major environmental threat in the UN Rio Conference and the Convention on Biological Diversity (CBD, 1992), which can be viewed as a second milestone in the studied conservation efforts. The Yakutian Cattle were recognised as worth conserving at several levels of governance at the same time, which enabled the cattle to survive the turbulence of privatisation. The conservation efforts accelerated after the collapse of the Soviet Union, and the Sakha Republic took responsibility for the conservation of Yakutian Cattle. During this era, biodiversity and environmental concerns influenced the scheme (II). In the conservation of the Yakutian Cattle, the next milestone was reached in the early 2000s as the Sakha Republic enacted its own law on the conservation and sustainable use of the Yakutian Cattle and its genetic resources. As a part of a social and economic development programme, private individuals have had access to micro credits, cash

to buy young stock, reindeer and cattle. Moreover, households have also received subsidies from the government for keeping the cattle and selling milk (I).

The conservation of the Yakutian Cattle confirms the relevance of multi-level governance in the development of conservation: vertically different layers of authority have affected the conservation from the FAO and the USSR to the Sakha Republic down to the local level (II). Hierarchical governance and state intervention played a central role in the early phases of the conservation of Yakutian Cattle in the early 1980s, when state farms for conservation were established. There was also a phase of opposition and self-governance at the beginning of the 1990s when the privatisation of cattle production occurred. In this context, self-governance refers to the situation in which people or a group are able to exercise all of the necessary functions of power without any clear intervention from the authorities. In the case of Yakutian Cattle the phase of self-governance had a successful outcome: the cattle survived thanks to local people and the scientific community, whose awareness of the benefits and values of the cattle had arisen before the collapse of the Soviet Union. Different results could have occurred (II).

Speth and Haas (2006) emphasise the role of NGOs, especially during the early stages of environmental policy processes, as actors bridging the gap between scientists and policymakers and working with the media to bring issues to broad public attention. In the context of the conservation of the Yakutian Cattle, the role of NGOs has been different, and the initiative has remained with the scientists following the international development. Currently, the environmental movement in Russia is politicised under growing pressure from the state, and it is practically impossible to separate ecological demands from social and political ones, i.e. defending basic human rights and freedoms (Yanitsky, 2012). Along with the law of conservation and the introduction of subsidies in 2001 the role of the republic and top-down conservation has become stronger again (II). If the local people are seen only as a resource for conservation, conservation cannot be considered sustainable in the long term. Therefore, there is an urgent need for co-governance, sharing of power and participatory planning and joint decision-making in cattle production and conservation activities. Co-management presumes taking different motives into account generating trust among various actors, which can be seen as useful considering the aims of the conservation in the long term (II).

The Finnish case study was conducted chronologically after the Sakha case. It was able to use the results of the previous case, i.e. in terms of the development of the conservation at the international level, and it was able to start out as a

descriptive study (III, IV). Similarly to Siberia, the numbers of native breeds had decreased during the modernisation of agriculture after the Second World War. The risks connected to the loss of native breeds were realised by some scientist working with genetics in the 1960s and 1970s and measures to conserve the breeds were carried out according to the international conventions starting from the early 1990s. Furthermore, in Finland the initiative for conservation came from natural scientists and other enthusiastic individuals who wanted to prevent the destruction of Finnish landraces (Karja & Lilja, 2007). Nowadays the governance of the conservation is both multi-level and multi-polar as it consists of several levels and sectors. First, there are international agreements, both legally binding and non-binding. Then there is the EU level, which negotiates and cooperates on the national level. In addition, there is cooperation at the Nordic level. At the national level, the administration of genetic resources is divided between the Ministry of Environment and the Ministry of Agriculture and Forestry. The farm animal genetic resources are part of the administration of the latter. On the implementation level, there are NGOs, private farmers (often members of NGOs) and gene registers that act in close cooperation (IV).

Another milestone in the policies concerning agrobiodiversity conservation is the ecosystem services approach that has developed in the 2000s (III). In the European Union, conservation of agrobiodiversity is increasingly turning towards market-oriented conservation governance where farmers are seen as producers of ecosystem services taking advantage of emerging market opportunities. State-supported agro-environmental schemes (AES) and payments for ecosystem services (PES) are the most common mechanisms for the transaction of environmental goods and services between the farmer and the government. Thus, the conservation of agrobiodiversity is transforming into the delivery of ecosystem services. This process presents new risks and challenges, especially in economically challenging times, because the private sector cannot be obliged to maintain local breeds at any cost. It also provides conservation with new opportunities, such as the utilisation of native breeds in rural services and for the production of specialty products (IV).

5.2 The competing arguments concerning native breeds and their conservation

Several competing arguments that have contributed to conservation discourses can be identified in the development of native breeds conservation. Actors who are engaged at different levels and in varied sectors of conservation have argued separately for conservation and formed discourse coalitions. These competing arguments, discourses and coalitions can be recognised in both case studies. In the Sakha case, the development of conservation covers a long period of time. Therefore, coalitions within different socio-historical contexts can be identified (I, II). In the Finnish case, the current organisation of the conservation is emphasised. The ecosystem services approach is used to reveal the benefits and values connected to native breeds in Finland (III, IV).

The arguments for conserving the Yakutian Cattle are different at different levels and in different sectors of conservation. First, there is the scientific community that has been the initiator of the conservation process (I). This formed the first discourse coalition for the conservation of the Yakutian Cattle, i.e. they argued for conservation in a similar way (Hajer, 1993; 2016; see also Lyons, 2013). Their concerns are mainly dealing with genetics. They want to safeguard the genetic resources of the cattle breed in order to be able to experiment and create new breeds, which would be better-yielding than the indigenous breed but which could carry the important traits of the Yakutian Cattle, such as resistance against certain cattle diseases and the ability to survive in extreme climate conditions on poor feed. In order to make the conservation possible, researchers have justified the conservation in mainly economic terms to the decision-makers at the republic level. The possibility to improve cattle production in the republic, and thus to overcome environmental barriers and to make a larger part of the territory habitable has represented an additional reason for the conservation as far as the decision-makers are concerned (I, II).

In addition, the administrators and politicians at the republic level have argued for the conservation of the cattle in cultural terms (II). They form the second discourse coalition for the conservation of the Yakutian Cattle. In their view, the cattle breed has to be safeguarded not only because it is the most adapted breed to the local conditions, but also because of its significance to the local culture. This message has been transmitted to the local residents by the media. The local residents have kept the Yakutian Cattle for centuries as their traditional livelihood, and are pleased to become aware of the additional benefits communicated to them

by the decision-makers through the media. The local residents form the third discourse coalition for the conservation of the Yakutian Cattle. The cattle breed is an essential part of the local culture as it has safeguarded the survival of the northern people and maintained their traditional way of living over the years. Yet, for the local residents, the cattle are of mainly economic and social importance: the cattle enable them to continue their traditional livelihood and to generate extra income through the tailored subsidy system created by the Sakha Republic. On the other hand, the cattle also make it possible to be engaged in cattle husbandry and hence to remain in traditional, remote villages (II).

Similarly to the case of the Yakutian Cattle, from the viewpoint of genetic researchers in Finland, the aim of maintaining indigenous breeds is to retain their genetic resources by raising them and increasing their numbers with animals that belong to the same breed. In Finland, in order to receive subsidies, the animals have to be pure-bred and, as a rule, at least 4th generation animals (Mavi, 2016a). However, the financial support has not been a decisive motivational factor for farmers in keeping the breeds. The reason for this is economic: the amount of the subsidies is not enough to compensate for the lower yield of the indigenous breeds (Karja & Lilja, 2007)[8]. Therefore, there have to be other benefits and values related to the native breeds as far as farmers and other actors keeping the breeds are concerned. These benefits and values were identified with the ecosystem services (ES) classification in the second case study (III, IV).

The stakeholders interviewed in Finland were able to identify native breeds as producers of ecosystem services (III). In addition to provisioning services, cultural ecosystems services (CES) were identified by stakeholders in different ways: from their existence and bequest to their use in rural livelihoods e.g. in form of gastronomy and tourism (III). It is possible that the CES were highlighted because all stakeholders were engaged in the conservation of native breeds, and thus in favour of their conservation. They underlined the specialty of native breeds compared to mainstream breeds, because speaking purely in terms of provisioning services, especially yields, the native breeds cannot compete with mainstream breeds. However, the identification of ecosystem services by the stakeholders strengthens the perception of ES as a feasible approach in recognising the benefits obtained from native breeds and the values underlying them. Farm animals,

[8] The indigenous breeds that receive subsidies are three breeds of Finncattle, three breeds of Finnsheep, Finngoat, Finnhorse and Finnish chicken. The keepers of local breeds can make environmental agreements with the government. The support is 530 euros / animal unit / year for cattle and 300 euros / animal unit / year for sheep, goats, horses, chicken and roosters (Mavi, 2016a).

whether native or mainstream breeds, are cultural animals, whose maintenance is dependent on human activities, and therefore the recognition of the benefits and values connected to them is important. Thus, ES can be used as a communication tool for policies instead of a mere monetary valuation of the benefits obtained from nature (III).

Moreover, actors involved in the conservation of native breeds have different standpoints in how they perceive the various means of the conservation and use of local breeds in rural livelihoods (IV). These perceptions form storylines. The storylines also reflect the viewpoints of these actors on ownership and partnerships regarding the breeds. Some of the stakeholders are enthusiastically in favour of conservation and for the purity of landraces, which signifies a more or less the romantic way of thinking. They were in favour of service-based conservation and did not want any kind of commercialisation or commodification of native breeds but to keep them as pets or hobby animals. Another group consist of those who make their living from local breeds, and were strongly in favour of service-based sustainable use. In their view, breeds should be utilised for tourism, rehabilitation services and other forms of service-based businesses. However, most of the interviewed stakeholders highlighted the production-based nature of local breeds, which is in line with the traditional focus on provisioning services. They felt that native breeds should be kept in product-based sustainable use, that is, in milk and meat production, i.e. the purpose they were originally selected for. Another way of thinking was to consider the breeds worth conserving but not identifying any business opportunities for them. In this line of thinking, the native breeds should be kept among other, better-yielding cattle breeds and the lower yields should be compensated by the AES or PES. This storyline is called product-based conservation (IV). Thus, discourse coalitions and discursive struggles arising from different positions of the organisations can be recognised in the case of the conservation of landraces in Finland.

5.3 The organisation of conservation

The organisation of the conservation is relevant to understanding current conservation in the Sakha Republic and in Finland. In order to analyse the organisation, the question of how different arguments are translated into policies and policy-making, has to be answered. These aspects are elaborated in both case

studies (I, II, III, IV), and in this summary essay the two case studies are analysed with an explanatory approach.

The conservation of Yakutian Cattle was related to certain key actors and their efforts. Currently (as in 2006) the key actors in the conservation of the cattle are the Ministry of Agriculture in the Sakha Republic, the Agricultural Institute operating in Yakutsk, and the Sakha Insemination organisation. It appears that the conservation of the Yakutian Cattle is yet again based on top-down policies rather than bottom-up initiatives, although there were signs of co-governance and even self-governance in the earlier phases of conservation (II). The potential of the genetic resources of the Yakutian Cattle for future breeding purposes form the basis of the law intended to safeguard the cattle breed. Hence, the arguments of the genetic researchers have most noticeably translated into policies and policy-making in Sakha. The current subsidy system supports the local communities in keeping the cattle. Consequently, it helps in keeping the north settled and maintaining traditional livelihoods, as the administration and politicians in the republic have striven for. The maintenance of a living cattle population is highly dependent on people willing to keep them in their local community (II). Simultaneously, the people keeping the cattle are highly dependent on government subsidies, in addition to the cattle providing them with a certain level of self-sufficiency (I).

Regardless of the dominance of hierarchical governance, at the implementation level in the northern periphery, conservation of native breeds is organised among different local actors. In practice, their role is more important than could have been anticipated after the long tradition of top-down policies. The cattle breed provides the local residents with different benefits and reflects diverse values forming an important part not only of the economic but also of the social and cultural aspects of the lives of the residents, and safeguards their northern traditional livelihoods in general. The organisation of the conservation at the implementation level is still negotiated and the problems are solved beyond the formal institutions, not in modern but in traditional ways. Therefore, a discrepancy between the existing institutional order and actual practice exists (II). Earlier on this was even more obvious as communities with their traditional ways of life maintained the cattle despite the efforts of the government to replace it. The slower changes in Siberian rural areas compared to the pace of productional-technological changes preferred by the Soviet rulers played a key role in saving the cattle breed (see also Kerkelä, 2004). Thus, there were aspects of institutional ambiguity (Hajer, 2003) as the formal institutions were not able to implement their

policies. This was mainly due to the challenges in overcoming environmental barriers with technology (Granberg et al., 2009).

The Yakutian Cattle breed is not in danger of becoming extinct in the near future. The value of the cattle is recognised at different levels of conservation, and there are people willing to continue cattle rearing in the north. The challenges have more to do with strengthening the participation of different actors in the conservation process, especially at the local level. There might be challenges ahead in terms of cooperation at different levels due to the different reasons for conservation (II). The cattle breed survived the turbulent 20th century. Yet, history has shown that there can be rapid changes in societal and governmental structures and their financial bases that may alter the situation once again. Changes in one sector of society are typically, although not certainly, followed by others resulting in changes throughout the entire society (Kerkelä, 2004). Therefore, it is important that cattle husbandry is secured in a socially, economically and environmentally sustainable way (II). The interaction between different institutions, i.e. the institutional fit, is becoming increasingly important in conservation (Hiedanpää, 2005).

In Finland, there is no common or widely-agreed vision of the conservation and sustainable use of the local breeds, and aspects of institutional ambiguity (Hajer, 1993) can be identified. The EU has specific Rural Development measures targeted towards the preservation of habitats, and biodiversity requirements included in the scope of cross compliance[9]. In addition, the EU has launched a specific Community programme which finances measures to promote the conservation, characterisation, collection and utilisation of genetic resources in agriculture. There is also an EU Biodiversity Strategy and a number of sectoral Biodiversity Action Plans, including one for agriculture, that are central elements for the preservation of biodiversity. The Biodiversity Action Plan for Agriculture is based on the use of a number of CAP instruments benefiting biodiversity. This includes measures that encompass environmental requirements integrated into market policy and targeted environmental measures that form part of the Rural Development Programmes (European Commission, 2016). The conservation of native breeds is different in different EU Member States, and the EU does not determine the conservation in detail. In other words, the governance of the conservation of landraces has to be

[9] Cross-compliance is a mechanism that links direct payments to compliance by farmers with basic standards concerning the environment, food safety, animal and plant health and animal welfare, as well as the requirement of maintaining the land so it is in good agricultural and environmental condition.

combined with existing formal and informal institutions in each Member State (see also Hiedanpää & Bromley, 2016).

Although the agro-environmental issues are regulated at the EU level, there are still challenges with national level cooperation. As both the agricultural and the environmental sector participate in the decision-making concerning agro-environmental policy, economic and environmental arguments easily compete in the decision-making and policy design. The agricultural sector generally defends livelihoods and the environmental sector stands up for the environment, although the cooperation between these sectors has improved during the recent years and the perceptions of both parties have been acknowledged to a larger extent by the other (Kaljonen, 2011; Kröger, 2009). Both the agricultural and the environmental sectors are involved in the Council of Genetic Resources that operates under the Ministry of Agriculture and Forestry. The activities and progress of the Finnish National Animal Genetic Resources Programme are supervised and followed by the Council. Regarding the conservation and sustainable use of biodiversity and benefits provided by ecosystem services in rural livelihoods, the Finnish Rural Policy Committee[10] has set its target for the year 2020. The use of ecosystem services will be emphasised in measures aiming to develop economic and production structures in rural areas. Moreover, new innovations regarding the sustainable use of ecosystem services obtained from rural environments are supported by directing research and implementing its results in practice (IV).

The EU is currently shifting the focus to market-oriented approaches that are not completely compatible with the conservation of biodiversity. Yet, the new orientation brings about both challenges and opportunities to conservation. It acknowledges agriculture as a producer of different types of ecosystem services, and stresses that the conservation and the needs of rural livelihoods are not necessarily in conflict. This could be a new solution for combining the conservation and sustainable use of local breeds with the aims of rural development and maintaining and improving livelihoods (IV).

The stakeholders interviewed in the case study concerning the conservation of native breeds in Finland were able to see different possibilities for using local breeds according to the ES framework. However, their views on how the use of native breeds in rural livelihoods and development should be organised differed

[10] The Rural Policy Committee is a cooperation body and network appointed by the Government. Members come from different ministries and administrative bodies, specialist organisations and various associations. The Rural Policy Programme is the action programme of the Committee. Besides the central government, the measures are carried out by municipalities, associations, educational institutions and other organisations.

from each other resulting in discursive struggles (Hajer, 1993; Lyons, 2013) over the right and wrong ways of implementing conservation and sustainable use (IV). Nevertheless, identifying ES is a strength concerning conservation policies. The recognition of native breeds not only as AnGR or lower-yielding producers of provisioning services gives an opportunity to bring them out of the 'margins' where they still tend to belong (IV). For example, in the Netherlands indigenous breeds are kept by farmers and associations as components of a multifunctional type of agriculture (Ovaska et al., 2014). Different actors and institutions engaged in the conservation of local breeds could benefit from their individual strengths, if they could interact properly with each other and the biophysical environment (Young, 2002; 2003, see also Hiedanpää, 2013).

6 DISCUSSION AND CONCLUDING REMARKS

6.1 Development of the conservation

In this thesis, the development of the conservation of native breeds has been demonstrated in two case studies. Similarly, to many environmental challenges (Haila, 2002), natural scientists were the first to notice the threats concerning the loss of native breeds and their genetic resources (AnGR). In the beginning, the worry on a global scale was about losing AnGR in developing countries where native breeds were replaced with better-yielding breeds at a fast pace. Genetic researchers also noticed the development in industrialised countries, such as Finland (Karja & Lilja, 2007) and the USSR. The natural scientists formed a discourse coalition (Hajer, 2016), the aim of which was to highlight the loss of AnGR. However, political support was still weak and the loss of AnGR was not recognised as a global political issue outside the scientific community. The scientific community needed more political support and eventually gained it by reframing the issue, and forming a coalition with other institutional actors (see also Tamminen, 2015), such as politicians.

As shown in the previous chapter, the efforts to gain support were eventually successful, and in the UN Rio Conference in 1992 genetic resources were recognised as part of biodiversity, the key theme of the conference (CBD, 1992). In addition to the biological side of the issue, the conservation of native breeds has been intertwined with other global agreements and declarations, such as the Convention Concerning the Protection of the World Cultural and Natural Heritage (1972) and the UNESCO Universal Declaration on Cultural Diversity (2001). This stresses the social and cultural aspects of the conservation, and thereby biocultural diversity (Maffi & Woodley, 2010). The specification of environmental problems and the means of solving them typically require multidisciplinary thinking (Haila, 2002) because they are complicated and need to be analysed from different perspectives, by examining areas such as social and economic aspects.

Thus, in the case of conserving native breeds, the concerns of genetic researchers for the loss of AnGR have transformed into global challenges related to environmental, economic and social sustainability discussed by a

multidisciplinary range of scientists. As shown in this study, it is not only a question of conserving the AnGR but of conserving indigenous communities and their cultures, and revitalising rural areas in industrialised societies. The conservation and sustainable use of native breeds play a role in sustainable agriculture and related livelihoods. Agriculture-enhancing biodiversity, including native breeds, represents a way of improving agricultural sustainability at the local level, but the global situation has to be taken into account as the scales of agricultural production typically interact (Zimmerer, 2006). Sustainable agriculture in turn is connected to the vitality of rural areas. The conservation of AnGR, as well the vitality of rural livelihoods and areas and communities are all part of enhancing sustainable agriculture. Simultaneously the conservation of native breeds has become politicised, on some occasions unintendedly, as different meanings have been connected to the conservation, and discourse coalitions with varying goals have been formed.

The international efforts to conserve AnGR have been criticised for giving the rights over genetic resources to nation states and for not defining what exactly the object of conservation is – the genes or the diversity of the animals themselves. Earlier, animals, breeds and their genetic resources were governed by rights relying on physical access and rights of use. Because the recognition of AnGR loss as a global problem required cooperation between FAO and UNEP, the conservation of farm animal genetic resources began to resemble that of plant genetic resources (Tamminen, 2015) – a resource much easier to govern than that of animals with fewer ethical questions to be solved (Hoffmann et al., 2014). As such, ownerships and partnerships are relevant for the conservation of agrobiodiversity (Hodge & Adams, 2014). However, while acknowledging this on the global scale, it should be noted that the conservation consists of individual cases. In the Sakha case, the criticism is less feasible as it is focused on ownership rights that the signatories of the CBD (1992) received and whose ownership was completed by the Nagoya Protocol (2010). The cattle were already owned by the state, the USSR, since the collectivisation era, and the 1990s brought about a new era of self-governance (see e.g. Driessen et al., 2012) and private ownership. The conservation is now in the hands of the Sakha Republic, which means the conservation efforts and key actor involved in maintaining the breed is the nation state level.

Furthermore, there is also a question of what exactly is and should be conserved (see e.g. Braverman, 2014; Stronen & Paquet, 2013). As this study indicates, it is important to distinguish between the conservation of native breeds as live animals and the conservation of their genetic resources. From the perspective of ecosystem

services (CICES, 2013), the genetic resources are a benefit obtained from native breeds (genes as a tangible product are a provisioning service, genes as an option for future breeding are a regulation and maintenance service). The genes are not the only benefit produced by native breeds. There are other provisioning services, such as meat, milk and skin, as well as cultural services including their role in history or several forms of rural services that distinguish native breeds from other farm animals. Mendelsohn (2003) notes that if the purpose of the conservation is to protect the AnGR, the conservation is likely to have international support since it benefits the whole world. If the indigenous breeds are important in maintaining the local landscapes and environments, the support and conservation programmes will consequently be locally based and require sufficiently large populations to achieve a desirable effect. The optimal design of conservation programmes depends on the motivation for the conservation in question and the right balance between local, national and international efforts, and the responsibilities regarding the conservation will change accordingly.

Moreover, there is usually a long period of transition from political will to real implementations of conservation programmes at the grassroots level. This time span leads to challenges in the conservation of indigenous farm animal breeds and their genetic resources (Tamminen, 2010). There are differences in the governance of the conservation of native breeds in the case studies. Yet, both in Sakha and in Finland it has been up to individuals at the implementation level to keep the live animals and to maintain their genetic diversity. Sometimes this has been possible with the help of the administration; but most of the time it has been despite of the administration (Granberg et al., 2009; Karja & Lilja, 2007). In practice, governance existed long before the concept came into use and the assumed shift from government to governance occurred (Colebatch, 2014).

The agricultural production environments at the implementation level differ from each other in the case studies. Indigenous breeds form the basis of agricultural production mainly in developing societies where the production technologies and resources for agricultural production and cattle rearing are not at the same level as in more industrialised countries. Indigenous farm animal breeds have been maintained in primary production especially in marginal agricultural areas where they have adjusted to local climate conditions (Narloch et al., 2011; Drucker et al., 2001). The challenges presented to agriculture caused by climate conditions are often so great that more commercial breeds cannot manage and produce as well as they might in more favourable agricultural areas. Typically, harsh climate conditions include e.g. extreme coldness and dryness as in Sakha (FAO,

2007; 2010). In Siberia, the cattle were saved because of the remoteness of the area and its extreme living environment. Despite the top-down policies of the state (see e.g. Kooiman, 2003; Driessen et al., 2012), the cattle were kept by the indigenous people who had lived with the breed for centuries. In a way, this is the strength of the conservation efforts of the Yakutian Cattle: the breed is part of the culture and livelihoods of the Sakha people living in the extreme production environments. The cattle breed is protected nowadays by law and financed by the Sakha Republic, which strengthens the conservation given that environmental movements and other NGOs have become state-controlled in the past decade (Crotty et al., 2014; Yanitsky, 2012). For the republic, it is a question of social and economic development in the remote northern territories, and of national culture, which provides them with a reason to finance the conservation. In general, an obstacle to environmental management and sustainable development in Russia has been that people are not interested in the environment (Crotty & Hall, 2014). In that sense, keeping the breed and its genes as a national treasure is a factor that enhances the conservation in the long run.

Additionally, in the more industrialised areas, the numerous identified reasons for conserving indigenous farm animal breeds are not necessarily sufficient to preserve them in reality. The changes in agricultural production have made indigenous breeds rare in the course of the 20th century in countries like Finland. The role of indigenous breeds is mainly to be minor components of multifunctional agriculture or sustainable rural development. In Finland, native breeds have remained in the margins. Firstly, such breeds became the cattle found in remote areas and gradually have been raised by people believing in alternative ways of living, and more recently have become of interest to new rural entrepreneurs (Karja & Lilja, 2007). This development is connected to the debate on post-productivism that was especially prevalent in the late 1990s and early 2000s (see e.g. Marsden, 2013). Native breeds cannot compete with other breeds in terms of yield, and therefore considering their role in other activities is highly relevant to their conservation and sustainable use. During the past years the values and benefits obtained from native breeds have been recognised in society and new forms of rural livelihoods have provided new roles for native breeds. This has to do with farm diversification: deepening (on-farm sales and processing) and broadening (agro-tourism, care farming, nature conservation) what is promoted to enhance rural livelihoods and rural development (Meraner et al., 2015). In general, the focal point is where local food and service initiatives can come together with a sufficient consumer base. There are no easy solutions, and many of the current

alternatives, such as institutional procurement, value chains and consumer or producer cooperatives often face practical logistical challenges (Mount, 2012). Different alternatives for native breed dairy and meat products are still in their early stages in Finland, and producer organisations and cooperatives that are common in countries, such as the Netherlands, are rare. This is partly because of support systems that require minimum sales and minimum numbers of participants as a prerequisite for registration (Mavi, 2016b).

It is important that institutional settings fit and interact with each other for successful conservation and sustainable use (Hiedanpää, 2005). When there are no clear rules and norms, different institutional settings come together in varied practices creating institutional ambiguity, which can result in a mismatch between institutions with different policy-making settings (Hajer, 2003; Leeuwen et al., 2012). As a result, there is a considerable risk that different views and ways of acting do not communicate with each other and the potential of native breeds for rural development and diversification of the rural economy remain unused. This is especially true in the case of the conservation of native breeds in Finland, where the potential of native breeds could be used more in developing rural livelihoods. At the moment, there are aspects of institutional ambiguity. Furthermore, in both case studies there still exists the risk that despite of intentions to strengthen the participation of implementation level actors, in reality top-down governance prevails and the actors whose livelihoods are concerned are not involved in the policy-design. This threatens the legitimacy of the decision-making (see also Salmi, 2013) as it underlines the gap between policy intentions and their realisation in practice.

6.2 Future of the conservation

The conservation of animal genetic resources (AnGR) is safeguarded by international agreements and cooperation as shown in this thesis. Thus, the challenges related to institutional settings consist mainly of carrying out the intentions agreed upon internationally. Over the past twenty years substantial efforts and progress have been made and national programmes, NGOs, and producer-based activities have been initiated for *in situ* and *ex situ* conservation, the latter in forms of nationally and globally existing gene banks (Paiva et al., 2014). The threats for *ex situ* conservation concern for the most part failures in technologies, such as the disappearance or destruction of saved material. This is

possible in societies in transition, such as the first case study of this thesis in the Russian Far East. The situation is somewhat different regarding *in situ* conservation. It is not only a technical issue, but intertwined with economic, social, cultural and political aspects as this study has confirmed, it involves questions of rural development and livelihoods. So far, the greatest challenge related to the conservation of native breeds has been agricultural modernisation, particularly in terms of new breeds. However, in the future, global drivers of population growth, income, and climate change constitute a new threat to biodiversity, including native breeds and traditional livelihoods connected with them (Paiva et al., 2014). At the same time, native breeds and their AnGR are regarded as responses to environmental challenges, such as increasing dryness due to climate change (Drucker et al., 2001).

Indigenous cattle breeds and their genetic resources may offer a huge potential in future cattle-breeding because they are adjusted to poor feeding in difficult environments. Therefore, the conservation of farm animal genetic resources comprises an important part of the response to future challenges in terms of global climate change and population growth. The sustainability of animal production systems and future food security require access to a wide diversity of animal genetic resources (FAO, 2007; 2010). There are several questions concerning genetics that should be considered in developing strategies aiming to respond and to adapt to climate change. It may become important to choose among breeds or even species according to their suitability to the changing environment. In other words, breeds with the potential to adapt to new conditions and tolerate new diseases will be needed in the future (Kantanen et al., 2015).

Currently, the loss of genetic diversity is continuing at accelerating rates, and better ways to encourage biodiversity conservation and economic development in developing countries are needed (Hoffmann, 2011). The main challenge is to find means for preserving local breeds in rapidly changing systems of livelihood. There are a substantial number of *in situ* schemes maintained by governments in developing countries. As noted earlier, conservation approaches must be environmentally, socially and economically sustainable to avoid failing practically and ethically. This is because conservation has to respond to ethical obligations beyond the conservation of biodiversity, including poverty, social justice, cultural integrity and improvement in human livelihoods. Yet, for example, the design and structure of conservation efforts can negatively impact people's access to resources, or privilege one group of people over another, or protect some breeds at a cost to others (Robinson, 2011).

Furthermore, the maintenance of live animals for purely conservation purposes is becoming too expensive globally (Paiva et al., 2014). It is still true that farm animals provide rural populations with several direct and indirect benefits, such as food, manure and draught power. In addition to these direct benefits, livestock contribute to social and traditional structures, that is, to cultural identity and traditional livelihoods among people who have kept them for centuries, as is the case in the Sakha Republic. Moreover, livestock can also provide cattle-rearing people a form of insurance for the future against climatic and market risks, and are only sold during emergencies (Zander, 2006). Paiva et al. (2014) suggest that in developing countries, public sector *in situ* conservation could be reduced and transferred to the private sector and NGOs. The aim is that successful gene banking of livestock populations would enable producers, governments and NGOs to pursue actions that could achieve better productivity without the fear of genetic resources being lost due to political instability, environmental or economic issues. However, the potential risk of disappearance or destruction of gene banks still exists. Moreover, the perception does not pay attention to the importance of keeping live animals for other purposes than the option of future breeding.

As this study indicates, niche markets for native breeds are developing in industrialised countries, and they are based on the ecosystem services provided by native breeds both in terms of tangible products and various services. This niche market development has the potential to offer a greater level of sustainability to native breeds than subsidies that are dependent on public financing. According to Paiva et al. (2014), the development of niche markets suggests that governments and research institutes can divest their maintenance of *in situ* conservation populations and reserve their activities for technical support. This suggestion is based on the idea that *in situ* programmes are often dependent on government subsidies for producers to be successful and to compensate for raising lower-yielding breeds.

The development of niche markets is certainly a way to contribute to the *in situ* conservation of native breeds both in terms of products and services obtained from the animals. However, the enhancement of local food and niche markets requires taking local conditions better into account. More reflexive forms of governance are needed to unlock dominant paradigms and to open up debates on broader issues (Marsden, 2013), such as combining rural development with global needs for conserving genetic resources. Furthermore, niche markets for food can be integrated with other rural livelihoods and activities, such as tourism. This requires the combination of local resources, individual actions and institutional

activities (Sidali et al., 2015). One promising option to enhance niche markets are food hubs, which can bring together supply and demand using an online marketplace, which helps to overcome logistical barriers (Mount, 2012).

There is, however, a risk that a market oriented approach would make agrobiodiversity conservation tempting merely to small or medium-sized farms unable to respond to expansion and intensification demands and in risk of demise (Tilzey & Potter, 2008). In this sense, *in situ* conservation cannot be left as a responsibility for the private sector or NGOs alone, but the public sector is needed to guarantee the existence of the breeds. In other words, partnerships are required to conserve the native breeds (see also Hodge & Adams, 2014).

6.3 Concluding remarks

This thesis revealed that despite different contexts in the conservation of native breeds, common milestones, arguments and challenges regarding the development of the conservation can be identified. The conservation in both case studies has followed and contributed to international development, and has achieved landmarks benefitting from the opportunities that have opened up to conservation at national and local levels. The arguments for the conservation of native breeds consist mainly of biological, economic, cultural and social factors, such as the role of native breeds in future breeding, contributing to rural livelihoods and being part of human history and culture. Furthermore, the solutions that are needed to safeguard the future of native breeds are negotiable: landraces can be maintained if there are actors willing to aim for common goals in dialogue with other institutions and actors at different levels and sectors of conservation. For this purpose, the right balance between *in situ* and *ex situ* conservation, as well as questions of ownership between the public sector, private sector and NGOs need to be elaborated. To address issues of governance a thorough understanding of how social and ecological systems interact is needed. Similarly, a clear picture of institutions and their impact on different aspects of conservation, such as service provision, social relationships, and benefits distribution is important (Bennett et al., 2015).

The results of this thesis confirm that a common understanding of what the conservation of native breeds is, and how it can be achieved, is needed in the future. It requires multi-level and multipolar cooperation that provides actors with a coherent understanding of how to carry out the conservation (see also Hiedanpää

& Bromley, 2016). This will further help the farmers and other actors maintaining native breeds to make long-term decisions and commitments concerning conservation. The conservation of native breeds is widely recognised as an important goal for different reasons. However, the methods of conservation raise controversy between actors and institutions in favour of conservation *per se* as this study shows. In this sense, agrobiodiversity conservation and the challenges it encounters comprise mainly of human-human struggles (see also Salmi, 2013). Ideological struggle between nature protectionists, for example, and advocates for indigenous or poor people, as well as actors aiming to shift conservation from the margins to economic mainstream have typically characterised the conservation debates (Robinson, 2011).

Redpath et al. (2013) note that conservation struggles are still increasing and therefore need to be managed. This requires the recognition of shared problems and goals with awareness of the need for trade-offs and information that is based on transparent evidence. This will help to prevent the emergence of unrealised expectations and ultimately that of unresolved struggles. It is difficult to carry out win–win solutions that both conserve biodiversity and promote human well-being, and therefore there are advocates of several different perceptions on agrobiodiversity conservation. Pre-existing assumptions about the right approach to conserve breeds may limit the success of conservation policies and schemes (McShane et al., 2011). In practice, conservation should be based on a pragmatic approach that contains multiple means of conservation. It is necessary to take into account various trade-offs and considerations of economic, environmental and social aspects when selecting suitable approaches (Robinson, 2011). Successful biocultural approaches for conservation require trust, accountability, open communication, and participation to enable local innovations for the enhancement of sustainable development (Gavin et al., 2015).

This study leads to the conclusion that the introduction of the ES concept provides a suitable framework to organise the conservation of native breeds and to identify and recognise different benefits obtained from them and their underlying values. The ES framework identifies the co-evolution of humans and nature, and places cultural, regulation and maintenance services onto the same level of importance as provisioning services. Using ES as a communication tool may further promote understanding and agreement on desirable conservation – or at least the acceptance of different ways of organising it. The *ex situ* conservation of genetic material should be complimented with live animals in sustainable use or conservation in production of services or products. Furthermore, conservation

contexts need to be understood, and decision-making transparent in all sectors and at all levels of conservation. On the other hand, as this study shows, actors with appropriate agency may also have the power to overcome barriers encountered in institutions or policies.

Future research needs to study how to strengthen the partnerships between different players active in the sector, e.g., in form of producer organisations or cooperatives to create niche markets and to improve the *in situ* conservation of native breeds. Another research need concerns the evaluation of new challenges dealing with the conservation of genetic resources, e.g. access and sharing that is also connected to the conservation of indigenous people and their traditional livelihoods. The Nagoya Protocol (2010), and laws and regulations based on it, provide an interesting viewpoint on these issues. During the research, the question of human-animal interaction raising ethical questions emerged and is shortly dealt with in the fourth article of this thesis. This research theme needs more attention in the future. The high cost of live animals and need to respond to environmental challenges and changes in production systems leads also to ethical questions about abandoning the maintenance of certain native breeds or species.

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8 ORIGINAL PUBLICATIONS

6. How a cattle breed became the object of conservation

ULLA PARTANEN AND JUHA KANTANEN

FROM MAJORITY TO MARGINALITY

Yakutian Cattle are a purebred aboriginal native cattle population which has not been intensively selected for specific traits by humans (Romanov 1984, Li et al. 2007a). The number of Yakutian Cattle has fluctuated over the centuries (Table 6.1). There have been decades when the population has been greatly diminished, but from which it has later recovered. The harsh climate of north-east Siberia has had a great impact on agricultural production and on the living conditions of the inhabitants and it has not always been possible to feed cattle and keep people alive without decreasing the number of animals.

Although the data on cattle numbers in Sakha were collected as early as from the mid 19th century, the information can be considered more reliable only from the early 20th century. In that era the data collection system was more developed than before, which may, for example, explain the significant increase in the cattle population that was registered in Sakha in 1917. Nevertheless, the early years of the 20th century also allowed for productive agriculture due to milder weather. Therefore, the number of cattle increased rapidly according to the compiled statistics, reaching about 500,000 in Sakha just before the Soviet system became established. (Basharin 1962, 9-17)

Until the 1930s these Siberian native cattle existed all around Sakha until state farms were founded and the transfer of new cattle breeds, such as Kholmogory and Simmental breeds, to the territory began (Int. 1 and 30). In the Soviet Union, the long-term selection programmes for improving the production traits of cattle breeds were accomplished through a network of breeding institutes and breeding farms and the state artificial insemination stations. Breeding institutes and their satellite farms improved cattle breeding efficiency and the performance of breeds. They also reared bulls for artificial insemination stations and breeding stocks for 'production farms', the purpose of which was to produce milk and meat for consumption in the Soviet market (Dmitriev and Ernst 1989). However, such an organised breeding scheme was never established in the northern villages of the Yakut Autonomous Soviet Socialist Republic

Table 6.1. *The number of cattle in Yakutian region before the Soviet era. Source: Basharin 1962, 15.*

Year	Yakutsky district	Olekminsky district	Vilyuysky district	Verkhoyansky district	Kolymsky district	Total
1857	128,865	10,843	23,607	7,979	372	171,666
1860	266,345	11,468	88,801	6,292	465	373,371
1861	174,540	11,839	72,567	5,761	1,849	266,556
1865	141,339	12,156	86,480	5,390	1,892	247,257
1870	153,814	12,586	88,107	4,379	2,205	261,091
1875	161,350	12,905	87,889	5,989	299	268,432
1879	174,509	11,981	71,970	5,867	172	264,499
1891	140,543	13,569	55,698	2,923	666	213,399
1894	150,248	13,778	46,887	3,201	635	214,749
1901	199,391	13,315	65,527	6,678	2,467	287,378
1905	193,845	13,676	67,625	5,146	2,472	282,764
1910	217,391	10,418	64,054	5,564	3,422	300,849
1917	301,977	23,513	156,515	3,185	2,300	487,490

(YASSR). In the Soviet Union and in present-day Russia, the breeds for which there was selection and breeding were termed 'cultural breeds' and were distinguished from aboriginal breeds, such as the Yakutian Cattle, which required reduced management and were not included in a breeding programme.

Soviet cattle breeding was partly accomplished through extensive crossbreeding with west European breeds, such as Friesian, Red Danish, Angeln and others. Moreover, the majority of the Yakutian Cattle were crossed with the Simmental and Kholmogory breeds on a large scale from 1929 onwards, which resulted in the Far Eastern varieties of Simmental and Kholmogory breeds (Dmitriev and Ernst 1989, Li et al. 2005). In Siberia, the aim of the crossbreeding was to combine the adaptability of local cattle with the productivity of modern breeds. However, the study by Li et al. (2005) revealed that there is little contribution of the Yakutian Cattle to the present-day Siberian Kholmogory population, while in the Siberian Simmental, there is a greater, though not very significant, genetic contribution from Yakutian Cattle.

The multiplication of the Kholmogory and Simmental breeds led to the situation that was apparent already in the late 1950s, that the last purebred Yakutian Cattle existed only in the remote northern territories, where the transport connections were poor and distances long (Int. 66 and 70, see also Romanov 1959, 3).

> [The Soviet politics] simply wanted more production fast: the financial resources were considerable, and therefore they imported bigger cattle. They couldn't understand what the true nature of the Yakutian Cattle was because they were so small and produced so little. All they required was efficiency. They brought the big animals and as there was not enough feed for them to eat they sent feed by trains and aeroplanes. There was so much money! The

adaptation of stock is a long process, it takes decades. But the Party required efficiency! (Int. 66)

In the late 1950s, Docent P.A. Romanov published a study on the breeding value of the cattle (Romanov 1959). He suggested that the rare Yakutian Cattle were by far the best-adapted cattle breed to the conditions of the Yakut ASSR. The genetic resources of the Yakutian Cattle were considered to be useful in creating a more productive Siberian cattle breed that would be adapted to the hard, cold climate and poor nourishment. However, already at that time the Yakutian Cattle were in danger of becoming extinct due to the numerous attempts to replace them with other breeds. (Romanov 1984, 5, 7-9) Globally this state of affairs was not uncommon; the replacement of indigenous breeds had become a common feature of the modernisation of agriculture. The number of indigenous breeds diminished everywhere across the industrialised countries and new commercial breeds were replacing them at an accelerating rate.

All Siberian native cattle breeds except the Yakutian Cattle had already become extinct and therefore the Yakutian Cattle were the sole remaining indigenous Siberian cattle breed to represent important genetic resources that might be used in further crossbreeding. The high milk fat content was considered to be of particular importance. Nevertheless, there were several regions in the Yakut ASSR where the numbers of indigenous Yakutian Cattle were still falling. The conservation of the Yakutian Cattle was considered by some to be practically impossible (Korotov 1966, 3-4).

It was, of course, hard to oppose anything in the Soviet time, so the Yakutian Cattle were largely killed off. ... the scientists opposed the importation of new breeds because they knew that the new breeds wouldn't produce here as much as they did in their home countries. The productivity of imported breeds is low, you could even say that they decay, they degenerate more and more every year. (Int. 70)

The importance of conserving animal genetic resources was first raised in the USSR in 1927 by a Soviet geneticist, A.S. Serebryakovsky (Dmitriev and Ernst 1989, xiv). Many researchers in the Yakut ASSR, in the Academy of Science in Moscow and at the All-Soviet Research Institute of Farm Animal Breeding and Genetics in Leningrad studied indigenous breeds and published articles about them, although the official politics supported replacing indigenous cattle with other breeds (Int. 66). The research was still probably done because the crossbreeding plans required information about the indigenous cattle in any case. For example, the origin of the Yakutian Cattle was studied already in the pre-war period in the Soviet Union (Int. 1). Afterwards it has been argued that the researchers who studied the Yakutian Cattle exaggerated the productivity of the breed to some extent for the official statistics. This was probably meant to prevent the complete disposal of the cattle and to emphasise production-based economic values

as the strongest grounds for conserving a breed at the time, although the researchers had already justified conservation on the basis of genetic uniqueness. It was hoped by some that the genetic potential of the breed might be exploited for more profitable production in the future. However, in the mid 1960s, when the Communist Party shaped the strategy for Soviet agriculture, the main focus was on reorganisation of economic structures and conditions. Nevertheless, the policy also addressed making agriculture more efficient by intensifying the use of technologies. (Naukhatsky 1996, 17, 60-61)

> You know Romanov did [investigate the Yakutian Cattle]. The development work was a bit delayed though. (Int. 66)
> In the Academy of Science [some of the scientists] were against mass import. They had written a book about the Yakutian Cattle. ... Local scientists were against as well, but in vain. (Int. 70)

THE FIRST STEPS IN CONSERVATION

In the early 1970s the erosion of farm animal genetic resources raised international attention for the first time. The conference of the United Nations (UN) on the Human Environment, held in Stockholm in 1972, recognised this issue among other environmental threats. The UN's special programme on farm animal genetic resources started in 1974. The aim of the conservation programme was to collect information about endangered farm animal breeds and about the possible measures for conservation that were already initiated in various countries. The results of the first project were used as a template for a new programme, which aimed at studying the conservation of endangered farm animals worldwide. (UNEP 2006)

A list of farm animal breeds that were either endangered or at risk of becoming endangered was also published in the Soviet Union. The All-Soviet Research Institute of Animal Breeding and Genetics carried out the inventory work. Several cattle breeds were included on the list, including Yakutian Cattle – with 300 dairy cows. In general, the situation of many indigenous cattle breeds in the Soviet Union was considered to be dire and the valuable features and unique resources were in danger of disappearing. The Soviet Union made recommendations to conserve the genetic resources of their endangered farm animal breeds and these were addressed to organisations and implemented by the agricultural authorities and government farms. (Romanov 1984, 10-11)

> The discussions [about preserving the Yakutian Cattle] were raised by Leningrad researchers at the institute of genetics. I believe it was Ivanov Konstantin Mikhailovitch and scientists

such as Marushov from Moscow. In Yakutia Peter Appolonovich Romanov was the initiator. He got several big civil servants interested in the necessity of preserving Yakutian Cattle and I believe a huge document was issued in 1975 by the Yakutian regional committee of the Party about the need to preserve the cattle. (Int. 1)

According to Romanov (1984), conservation had two main goals: to maintain agriculture in remote areas that were neglected and to use and conserve animal genetic resources that had been able to adapt to various climatic, environmental and production conditions. The agricultural experts of the Comecon[1] countries drafted a research programme to solve the problems associated with farm animal genetic resources in the mid 1970s. The tasks were to define the unique features of endangered indigenous breeds, to make recommendations for the conservation of local breeds for the utilisation of their genetic resources, and to find effective ways to use the genetic variation. The recommendations were based on a classification that divided cattle breeds into three categories. The first category included native cattle breeds that had unique features, but were endangered. In the second category there were valuable local breeds that had diminished rapidly. The third category consisted of other local and imported breeds. The Yakutian Cattle belonged to the first category. The idea was to create special farms for each category in order to keep the indigenous breeds pure, and to organise sperm banks for future breeding experiments. (Romanov 1984, 9-11, 17-19, *Plan plemennoy raboty* 1981)

The Soviet authorities, such as the State Committee for Science and Technologies, the Ministry of Agriculture and the Academy of Science, formulated an all-Soviet conservation programme called *Genofond* that was meant to last from 1981 to 1985 during its first phase and later beyond that until 1990. The programme dealt with the conservation of animal genetic resources and it included a special part, which was called *The conservation of the genetic resources of indigenous and endangered farm animal breeds*. In this part of the programme attention was paid to the situation of the Yakutian Cattle. The author responsible for the part dealing with the Yakutian Cattle was P.A. Romanov. (Romanov 1984, 11, *Plan plemennoy raboty* 1981)

The programme aimed at the conservation of the cattle breed and the measures used were bound to produce results slowly but steadily. In connection with this programme, the Yakut ASSR drew up regulations for artificial insemination of the Yakutian Cattle (*Plan plemennoy raboty* 1981, 5). This indicated that in the 1970s and 1980s thinking had matured to consider other reasons for conservation than mere production. At least the possibility for improved productivity and other traits in the future seemed to

1 Comecon, the Council for Mutual Economic Assistance was an economic organisation of the socialist countries 1949–1991.

be a valid reason for conservation. The future breeding potential may also have been considered in view of the problems that Soviet agriculture was generally facing.

However, despite all the earlier discussions about the uniqueness of the Yakutian Cattle, the opinions of scientists in Leningrad and the decisions of the Party, upgrading of the last Yakutian Cattle with exotic genetic material was planned for in the 1970s and even applied in Batagay-Alyta, leading to a high risk of losing the last examples of purebred Yakutian Cattle. Frozen semen of a few Jersey bulls of British origin was used to inseminate some Yakutian Cattle.

> In 1975–1976, and even in 1974–1975, there was an experiment. They inseminated a little with the semen of English Jersey Cattle. This is also a breed producing high fat milk. In 1980 we found one cow named Eureka, which had an antigen of a Jersey cow. But we detected all her progeny and culled them. (Int. 1)

The crossbreeding of the last animals was strongly opposed: people recognised the uniqueness of the Yakutian Cattle. This was also acknowledged by the scientific community in Leningrad. The crossing was soon regretted and it was decided that the crossbred animals should be eliminated. The initiative for the culling came from P.A. Romanov.

The culling of hybrid animals was successful, as shown by the results of recent molecular genetic studies (Li and Kantanen 2009). In the study of Li and Kantanen (2009), the genetic profile of the Yakutian Cattle, which were assumed to have remained pure, was compared with that of the Jersey breed. DNA tests using microsatellite DNA markers did not show any genetic influence of the Jersey on the gene pool of the Yakutian Cattle in the villages of Sakkyryr, Kustur and Uluu-Syhyy. The breed comparisons based on DNA tests, combined with modern statistical analysis for revealing unhidden population structure (Pritchard et al. 2000), are powerful tools to unfold past crossbreeding. In addition, Li and Kantanen (2009) examined genetic relationships between the Yakutian, Kholmogory and Simmental breeds. These comparisons also demonstrated that the current population of Yakutian Cattle has had no genetic impact from other cattle breeds and has remained a pure population.

SLOW PROGRESS

The 11th five-year plan of the Soviet Union began in 1981. This plan concentrated on the improvement of agricultural productivity and did not pay any special attention to the conservation of animal genetic resources. Nevertheless, it highlighted the role of science and technology in solving the challenges to increased productivity. In agriculture this

was done, for example, with the help of crossbreeding cattle. At the same time the plan underlined the more effective role and responsibility of regions in the planning and realisation of agricultural productivity. (*Osnovnye napravlenya* 1981, 45-53) In general in the 1970s the focus of official agriculture shifted from economic structures towards improvements in material and technical issues. During the 1970s specialisation and concentration of production assumed greater importance. However, in the late 1970s and early 1980s agricultural productivity decreased. It was argued that among other issues one of the reasons for this was the poor state of animal breeding in the country (Naukhatsky 1996, 60-61, 65, 116, 123)

At the same time the Communist Party paid more attention to food production and supply in addition to the living conditions of the rural populations and the agricultural workers. In the early 1980s the Communist Party produced a Special Programme for agricultural production meant to focus on the problems of agricultural productivity and to establish measures to improve and intensify it. The scientific work aimed at creating new farm animal breeds of high quality in terms of production and efficiency, and improved national agricultural production. Furthermore, the special aim of agricultural production in Siberia, recorded in the plenum documents, was to provide local people with local food and to promote self-sufficiency in this respect (*Prodovol'stvennaya programma SSSR* 1982, 55-57, 64). Another goal was to promote self-sufficiency in animal feed (*Materialy XXVI s'ezda KPSS* 1981, 164-166). These are probably the two major instances where the Yakutian Cattle and conservation of their genetic resources for future breeding work officially saw the light of day. Environmental protection was also mentioned in the plan, but it focused on the conservation of land, water and forests. Biodiversity was emphasised when it came to wild animals, but farm animals did not receive any particular attention. (*Osnovnye napravlenya* 1981, 69-70, *Materialy XXVI s'ezda KPSS* 1982, 183-184)

Regardless of the efforts, apparently little was done in concrete terms to conserve or maintain the Yakutian Cattle in the 1980s. This was probably due to the political and social changes in the Soviet Union that occurred at approximately the same time as the programme was due to be carried out. The economic situation of cattle production in the Yakut ASSR, and in the Soviet Union in general, became worse towards the end of the 1980s. Nowadays some research scientists in Sakha cannot even recall much consolidated effort to safeguard the animal genetic resources during Soviet times by the authorities or politicians at the republic level. They remembered that some scientists, and especially P.A. Romanov, studied the Yakutian Cattle, but they claimed that the real work began in the mid 1990s when the political system had already been changed. (Int. 66 and 70)

Batagay-Alyta. April 2005. Photograph by Anu Osva.

The conservation of Yakutian Cattle nonetheless made some progress in the 1980s. One substantial action that occurred already during Soviet times was creation of a research station for Yakutian Cattle, which was initiated by the All-Union Research Institute of Farm Animal Breeding and Genetics, Leningrad and P.A. Romanov, who unfortunately perished during a hunting trip in 1982. In addition, the Sakha Insemination Organisation that also currently collects, freezes and sells sperm was founded and began its work in the 1980s. (Int. 1 and 8).

Although official Soviet politics began to be aware of the importance of the conservation of low-productivity but genetically unique cattle breeds for the needs of future breeding, it was still opposed by some individuals. A previous worker in the research station told of confrontations:

> Managers opposed us, especially during Soviet times, because in a planned economy everybody wanted to produce more meat and milk. For this purpose it was necessary to import productive cattle. It was possible to bring them in by planes. And we were against that. I had supporters in Yakutsk who had authority among the members of the Regional Committee. This came from the civil servants. And there was also danger from the scientists' side who wanted to have crossbreeding right here. [A Professor] came from Moscow; he wanted to crossbreed Yakutian cows right here. I opposed him. He was dealing with local hybrids and he wanted to inseminate our cows with sperm of other breeds to get results right away. (Int. 1)

THE NEW GLOBAL WAVE OF CONSERVATION

In 1987, the World Commission on Environment and Development (Brundtland Commission) published its report on sustainable development and the change of politics needed for achieving that (Dryzek 1997, 14). The UN conference on Environment and Development was organised in Rio de Janeiro in 1992 to encourage states and governments to rethink their environmental policies and sustainable development, including the use of non-renewable natural resources. Almost all the countries that participated in the conference signed the Convention on Biological Diversity (CBD), which concerned the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits arising from genetic resources. The CBD was also an important milestone in the conservation of farm animal genetic resources (CBD 1992). The CBD emphasises that if conservation or sustainable use of natural resources involves the needs and participation of indigenous peoples and local residents, they have to be taken into account. The conservation of natural resources should be improved by programmes that benefit local communities and traditional knowledge these people have may, in turn, benefit the conservation. Furthermore, the

In the daytime cattle move freely in the village. Even the bulls are peaceful and curious. Kustur. April 2005. Photograph by Anu Osva.

traditional ways of using natural resources should be maintained and promoted if they are sustainably based. (CBD 1992, Secretariat of the CBD 2004)

The Russian Federation ratified the CBD. Because of the federal structure of Russia, the sovereign subjects within it have the initiative when it comes to the conservation of different species. The Russian Federation's ratification enabled and obliged its subjects to take care of their environment and resources. The Sakha Republic is one of the richest republics in Russia in terms of natural resources, and therefore the republic plays an important role in the conservation of Russian biodiversity. The Russian Federation has enacted several laws on the environment concerning the interactions between man and nature, natural resources, utilisation of water systems and forests, animals, air and oceans (Gorokhov et al. 2005).

The Russian Federation's State Strategy on Environmental Protection and Sustainable Development was developed in 1994. The National Strategy on Sustainable Development was approved by the Russian Parliament in 1997. Many decisions made by the Russian Federation have nevertheless run parallel to environmental conservation and preservation work. Such include the downgrading of the Federal Ministry of Environment to the State Committee of Environmental Protection in the mid 1990s and its dissolution in 2000. The tasks of the State Committee for Environmental Protection and the Federal Forestry Service were given to the Ministry of Natural Resources. (Silfverberg et al. 2004, 14)

The federal laws direct the administrative frameworks for the conservation work on genetic resources. The Russian autonomous republics modify the laws to meet the precise needs for local conservation. In 2002, the Russian Federation enacted the Federal Law on Environmental Protection that defines the roles of different subjects of the Russian Federation in nature conservation work (Silfverberg et al. 2004, 14-16). In the case of the Yakutian Cattle, the Sakha Republic is in a most important position and it has worked for the conservation of Yakutian Cattle genetic resources within the frameworks provided by the Federation (Agreement 1995). Within the Russian Federation only the Sakha Republic has its own Ministry of Ecology (Crate 2006, 209).

According to researchers and state officials in Yakutsk and in the villages, they have no cooperation with any UN organisations, and they seem to believe they have developed the conservation programme for the cattle on their own initiative. At the federal level there are some research projects that aim to study breeds that are in danger of becoming extinct and they are processing a nationwide conservation programme for endangered breeds. There is also a federal law that regulates animal breeding, but there is no law specifically directed at endangered breeds. A plan for the law has been made, but it has not yet been approved. (Int. 66)

A LAW ON THE CONSERVATION OF CATTLE

> Yakutian Cattle attracted the attention of our government in 2002 when Shtyrov became the president. Since that time we have had normative acts ... There is a presidential decree and a government decree that support the gene pool of Yakutian Cattle. (Int. 60)

The conservation of the Yakutian Cattle reached a new phase when the Sakha Republic enacted a law on the conservation and use of the cattle in 2001. The Ministry of Agriculture and the Yakutian Agricultural Institute took part in the preparation of the law. It elevates the Yakutian Cattle to the status of an endangered breed. In 2004 the law was renewed to be adopted into the federal laws. According to researchers at the Yakutian Agricultural Institute, there were no essential changes made to it at that point (Int. 66). The law is unique, even in the global context.

The law aims at promoting the genetic diversity of the breed, keeping the breed pure and preserving it for future breeding. The law consists of regulations concerning the insemination, registration and farming of the cattle as well as of financial support designed for the public and private farms that keep the Yakutian Cattle. (*Zakon ot 7 iyunya 2001 goda 3 No 291 – II*)

The owners (keepers) of the Yakutian Cattle are obliged to:

1. comply with the breeding plan for the Yakutian Cattle;
2. comply with the regulations concerning the keeping of the Yakutian Cattle and with the administrative and professional standards concerning the production of animal-based products;
3. comply with the veterinary instructions and hygiene regulations concerning the transport and slaughtering of the animals, processing, storing and realisation of animal-based products;
4. comply with the veterinary orders of specialists in taking preventive measures and treating animal diseases.

The financial support is directed to the animal keepers according to number of cattle they manage. It also includes buying their milk and meat products. Secondly, the law guarantees both tax and credit privileges for the cattle keepers depending on availability according to future budgets and tax policies. Another factor in the support system is the financing of scientific research work on the conservation, use and development of the Yakutian Cattle gene pool, as well as the realisation of the already existing programme that aims to carry out the work listed above. It is intended that the work is financed by the republic, using local budgets together with income from the farm. (*Zakon ot 7 iyunya 2001 goda 3 No 291 – II*)

The annual budget of the Sakha Republic (Yakutia) allows for the following:

1. keeping of the Yakutian Cattle – for owners (keepers) of the Yakutian Cattle;
2. buying of animal husbandry products produced by the owners (keepers) of the Yakutian Cattle;
3. carrying out of the governmental programme for the conservation, use and development of the gene pool of the Yakutian Cattle as well as scientific research;
4. enforcement of the governmental order for scientific support on the conservation, use and development of the gene pool of the Yakutian Cattle.

The conservation programme works at the republic level, but it is formally part of the federal programme that aims at developing rural areas (Int. 65). Furthermore, the presidential programme for social and economic development of villages has been working since 2002 in Sakha Republic and is connected with the conservation of Yakutian Cattle (Int. 66). In practice the Ministry of Agriculture in Sakha initiated the funding for the conservation process, and it is the Yakutian Agricultural Institute that takes care of the practical duties with the support of the Ministry. Each district has a branch within the Ministry of Agriculture and takes care of accounting and budgeting of cattle and reindeer production (Int. 1).

The Yakutian Agricultural Institute tries to find ways to promote the genetic diversity of Yakutian Cattle and to develop the funding to maintain the cattle. One possibility is that the republic takes the genetic resources and funding completely under its control. Whatever the case, the researchers considered that the cattle should be saved not only for their genetic value, such as resistance to bovine diseases and production of delicious meat, but also due to their value in the cultural heritage of Sakha. The work is in its initial stages because of limited financial resources. (Int. 66)

One potential action would be the conservation of genetic material, semen and embryos, in a gene bank. However, artificial insemination does not currently include Yakutian Cattle, although frozen sperm from Yakutian Cattle bulls exist in the gene bank. The problem is that there are insufficient resources for artificial insemination and it is difficult and expensive to transport semen to the north by helicopter (Int. 66). Kinship among the bulls and their potential in the conservation of Yakutian Cattle has been estimated by DNA analysis (Tapio et al. 2009). However, researchers would like to increase the number of bulls represented in the gene bank. Sperm from the bulls could be used later in the conservation programme for the Yakutian Cattle. Embryos should also be stored, but again financial resources do not allow for it (Int. 71), the work requires several specialists and the risk of failure under field conditions in Sakha is rather high (Int. 1).

In the conservation of the living population, the administrative authorities and the researchers in Yakutsk have favoured the district of Eveno-Bytantay. In addition to its traditional role in cattle production, it is a distant and isolated location, which guarantees the purity of the breed. In Sakha, it is typical that breeding bulls graze with cows in open pastures with no fences. This increases the risks of crossbreeding with Simmental and Kholmogory bulls. The long history of cattle breeding within the same area was respected, and it was also considered important to continue the research within the same geographical district from the genetic research point of view. The research will be carried out in Eveno-Bytantay, although cattle were transported to some other distant districts to investigate them under different natural conditions and to ensure their conservation (see Table 2.1.). Researchers and politicians have realised that it is not possible to increase the numbers of cattle in Eveno-Bytantay because of the limits imposed by hay production.

> It is not possible to increase the livestock in Eveno-Bytantay district because there is not enough hay and grazing ground. They don't get supplementary feed, they don't supply combined feed and therefore they spend winters eating only hay. And grazing grounds are limited there. Sometimes they are flooded, sometimes they don't produce crops ... Last winter animals did well, but in some years loss of cattle is high. So to increase the numbers of Yakutian Cattle it is necessary to develop new grazing, even returning to abandoned areas. (Int. 63)

There is a state-owned enterprise Bytantay (until 2005, Yakutsky Skot) that keeps Yakutian Cattle in the villages of Kustur and Batagay-Alyta. Another state-owned farm has operated since the mid-1990s for conservation and research of the cattle breed in the village Uluu-Syhyy in Gornyy district, near Yakutsk (see Table 2.1.). Their budget comes entirely from the republic and is about five million roubles (€143,000) (Int. 1). These farms were united and the status of the farm was renewed in 2005. The farm was changed from a state enterprise with subsidised cattle production to a fully republic-financed state enterprise, which meant that it received financial relief (Int. 66). There were however still debts in 2005 that are a huge drain on the state farm's resources (Int. 8). The state-owned enterprise has had serious difficulties in paying the employees, the working conditions are difficult and some employees, when asked, said that they work in the cowshed just because there is nothing else they can do (Int. 44).

In addition to the state farms, there are several households that keep cattle either for their own consumption or to sell products to others. According to some researchers, the cows are better fed in the private farms than in the financially challenged state farm and therefore it is important to support cattle raising in the private sector (Int. 6 and 8). The number of dairy cows has diminished in general after the collapse of the Soviet

Union, although the cattle were not divided in such a radical way during privatisation as were the reindeer and horses. Furthermore, there are several veterinarians working in the district. They monitor the health of the animals and their products as well as the quality of hay (Int. 8). At the republic level there is also a new association for farmers led by the Minister of Agriculture.

There have been various kinds of incentives for buying and keeping cattle for at least the last ten years (Int. 25). As a part of the social and economic development programme, private individuals have had access to micro credits, cash to buy young stock, reindeer and cattle. Moreover, households have also received subsidies from the government for keeping the cattle and selling milk. When we asked about the current level of subsidies, they ranged from 1,500 to 3,000 roubles per cow (Int. 3 and 4). The system was still in its early stages and the exact amounts were changing and the operation of the system was still not entirely clear to everybody. Enterprises and private people make agreements with the procurement company Tyumsyu, and on the basis of these agreements they receive support in relation to the amount of milk and meat they sell. This system has kept people working with Tyumsyu. (Int. 25)

The lack of financial resources has complicated the conservation of the Yakutian Cattle and there are fears that the new self-governance of districts, including the Eveno-Bytantay district, aggravates the situation even more because the remote areas will largely be left to fend for themselves (Int. 66). On the other hand, self-governance means complete control of a locally administered budget. However, in Soviet times the resources intended for agriculture were much greater. For example, forage mixtures were brought to the Yakut ASSR for the cattle, mechanisation was more common and the subsidy system kept the prices under control (Int. 8).

TIMELINE FOR THE CONSERVATION

During the first decades of the Soviet era, Simmental and Kholmogory cattle breeds were transported to the *kolkhozes* and *sovkhozes* of the Yakut ASSR. These breeds were used for improving the Yakutian Cattle. However, the attempts failed due to restricted feeding possibilities and the new breeds did not produce as much as they did under better conditions. The results proved to be the reverse of those expected: the weight of the animals and the fat content of their milk both declined. The experiments to improve the quality of the indigenous Yakutian Cattle decreased the numbers of the breed. Already by the late 1950s Yakutian Cattle existed only in the remote northern territories, where the transport connections were poor and distances long.

Several researchers and authorities in the Soviet Union agreed about the crossbreeding and planning to replace the Yakutian Cattle in the 1950s and 1960s. However, some of the scientists in Yakutsk, Moscow and in the All-Union Research Institute of Farm Animal Breeding and Genetics in Leningrad were still willing to investigate the genetic resources of the Yakutian Cattle, and criticised the ongoing politics.

International efforts in the conservation of farm animal genetic resources were used to legitimise the conservation of the Yakutian Cattle by the genetics researchers. The failures in the modernisation of Soviet agriculture enabled conservation to develop in the Yakut ASSR from the mid-1970s. The first steps in conservation took place in the 1980s and the policy found more support after the collapse of the Soviet Union. In the early 2000s the Sakha Republic enacted its own law on the conservation and use of the gene pool of the Yakutian Cattle.

The early stages of the conservation of the Yakutian Cattle are strongly personified in one researcher, Docent P.A. Romanov, at least when it comes to the work done in the Yakut ASSR. Later developments are linked with the President of the Republic, V.A. Shtyrov. There are also local actors in Eveno-Bytantay and researchers in Yakutsk. Nowadays the need to conserve the genetic resources represented by the Yakutian Cattle is widely recognised and accepted and there are no acute threats to the existence of the cattle breed at the political level. Another aspect in future conservation is the role of households in raising the cattle. Furthermore, there have been initiatives to concentrate the cattle in the southern part of the republic, but many local residents in the Eveno-Bytantay district oppose the idea. In any case, the challenges for conservation have more to do with keeping the breed pure and increasing the number of cattle in the future.

Table 6.2. *Chronology of critical years for conservation of Yakutian Cattle*

Until the 1930s	Siberian Cattle common breed in the territory
1929–1939	Collectivisation of agriculture
1920s onwards	Transport of more productive cattle breeds to the Yakut ASSR
1950s	Enlargement of *kolkhozes*
By the late 1950s	Siberian Cattle exist only in the remote northern territories
1950s onwards	Researchers try to prevent the total extinction of the Yakutian Cattle
1972	UN Conference on Human Environment
Mid 1970s	List of endangered farm animal breeds and recommendations to conserve them published in the USSR
1980s	All-Soviet conservation programme *Genofond*. Research station for the Yakutian Cattle established. Sakha Insemination founded
1981–1985	11th five-year-plan
1985–1990	Gorbachev's reform policies
1991	USSR dissolved
1992	UN Conference on Environment and Development: Convention on Biological Diversity. New constitution of the Sakha Republic (Yakutia)
1990s	Privatisation of agriculture, approximately 80% of the Yakutian Cattle in private ownership
1994	The Russian Federation's State Strategy on Environmental Protection and Sustainable Development developed
1995	Russia and Sakha conclude a series of agreements delimiting authority between the republic and the federation
1997	The National Strategy on Sustainable Development approved by the Russian parliament
2001	Law on the conservation and use of the gene pool of the Yakutian Cattle enacted by the Sakha Republic
2002	Federal Law on Environmental Protection enacted by the Russian Federation
2006	Local government reform in Russia

APPENDIX: THE LAW ON THE CONSERVATION AND USE OF THE YAKUTIAN CATTLE GENE POOL

Якутские ведомости, 30.06.2001, Сокуоннар.Уураахтар. Дьаһаллар, 30.06.2001; 07.06.2001; З № 291-II;

РЕСПУБЛИКА САХА (ЯКУТИЯ)
ЗАКОН
от 7 июня 2001 года З № 291-II

Об охране и использовании генофонда Якутского скота

Принят постановлением Палаты Представителей Государственного Собрания (Ил Тумэн) Республики Саха (Якутия) от 07.06.2001 З № 292-II

Настоящий закон устанавливает правовые и организационные основы сохранения и рационального использования якутского скота, а также охрану и развитие его генофонда.

Раздел I. Общие положения

Статья 1. Основные понятия, используемые в настоящем законе

В настоящем законе используются следующие основные понятия:
а) якутский скот – аборигенный скот, приспособленный к экстремальным условиям Республики Саха (Якутия) в результате многолетней народной селекции;
б) генофондное стадо – группа животных локальной или аборигенной породы, выделенная для сохранения ее генофонда;
в) генофондное хозяйство – организация любой организационно-правовой формы, осуществляющая разведение якутского скота, а также его производство и использование в селекционных целях;
г) генофондный банк – подразделение племенной службы, занимающееся заготовкой, хранением семени быков-производителей и эмбрионов якутского скота, обеспечением ими организаций, крестьянских хозяйств и личных подсобных хозяйств граждан, содержащих якутский скот;
д) чистопородное разведение – разведение якутского скота в целях консолидации и типизации присущих ему признаков;
е) мечение – обозначение якутского скота посредством нанесения номера – татуировки, тавра, закрепления бирки, которые позволяют точно его идентифицировать.

Статья 2. Правовое регулирование в области охраны, использования и развития генофонда якутского скота

Правовое регулирование в области охраны, использования и развития генофонда якутского скота осуществляется законами и иными нормативными правовыми актами Российской Федерации, Республики Саха (Якутия), а также настоящим законом.

Раздел II. Государственное регулирование в области охраны, использования и развития генофонда Якутского скота

Статья 3. Компетенция Правительства Республики Саха (Якутия)

Правительство Республики Саха (Якутия):
а) определяет основные направления государственной политики в области охраны, использования и развития генофонда якутского скота;
б) регулирует отношения в области охраны, использования и развития генофонда якутского скота, а также экспорта якутского скота, его семени и эмбрионов;
в) разрабатывает государственную программу по охране, использованию и развитию генофонда якутского скота и порядок ее финансирования;
г) утверждает положение о генофондном хозяйстве.

Статья 4. Компетенция органа государственного управления в области сельского хозяйства

Орган государственного управления в области сельского хозяйства:
а) обеспечивает на территории Республики Саха (Якутия) проведение единой политики в области охраны, использования и развития генофонда якутского скота;
б) организует разработку и реализацию программ и мер по охране, использованию и развитию генофонда якутского скота;
в) утверждает стандарты, нормы и правила в области охраны, использования и развития генофонда якутского скота;
г) координирует экспорт якутского скота, его семени и эмбрионов;
д) утверждает порядок проведения мечения якутского скота.

Статья 5. Компетенция государственной племенной службы

Государственная племенная служба:
а) организует и координирует деятельность генофондных хозяйств;
б) осуществляет деятельностьпо заготовке, хранению семени быков-производителей и эмбрионов якутского скота, обеспечению ими организаций, крестьянских хозяйств и личных подсобных хозяйств граждан, содержащих якутский скот;
в) проводит работу по искусственному осеменению якутского скота, селекционную работу и бонитировку;
г) ведет государственную регистрацию якутского скота и его генофондных стад;
д) разрабатывает порядок проведения мечения якутского скота;
е) осуществляет иные функции, определенные законодательством Российской Федерации и Республики Саха (Якутия) о племенном деле в животноводстве.

Раздел III. Система ведения племенной работы

Статья 6. Государственная регистрация якутского скота и его генофондных стад

1. Государственная регистрация якутского скота и его генофондных стад осуществляется посредством внесения записей в государственную генофондную книгу якутского скота.
2. В государственную генофондную книгу якутского скота заносятся данные о племенных и продуктивных качествах якутского скота и его генофондных стадах, а также другие данные, необходимые для идентификации якутского скота и его генофондных стад, определения их происхождения и хозяйственной ценности.

3. Государственная генофондная книга якутского скота ведется государственной племенной службой.

Статья 7. Сертификация племенной продукции (материала) якутского скота

1. Племенная продукция (материал) якутского скота подлежит обязательной сертификации в соответствии с действующим законодательством.
2. Сертификат (свидетельство) является основанием для признания принадлежности конкретного животного к якутскому скоту.

Статья 8. Метод разведения якутского скота

При разведении якутского скота применяется только чистопородный метод разведения, за исключением тех хозяйств, где будут проводиться научно-исследовательские работы.

Статья 9. Ведение племенной работы

Племенная работа ведется государственной племенной службой в соответствии с действующим законодательством и настоящим законом.

Статья 10. Учет и отчетность

1. Собственники (владельцы) якутского скота ведут обязательный его учет, а также составляют отчетность согласно нормативным правовым актам Российской Федерации и Республики Саха (Якутия).
2. Инвентаризация якутского скота проводится один раз в год в установленные сроки.

Статья 11. Обязанности собственников (владельцев) якутского скота

Собственники (владельцы) якутского скота обязаны:
а) соблюдать план селекционно-племенной работы, проводимой с якутским скотом;
б) соблюдать правила содержания якутского скота, государственные и отраслевые стандарты производства животноводческой продукции;
в) соблюдать установленные ветеринарно-санитарные правила перевозки и убоя животных, переработки, хранения и реализации животноводческой продукции;
г) выполнять указания специалистов в области ветеринарии при проведении мероприятий по профилактике и борьбе с болезнями животных.

Статья 12. Условия использования якутского скота, его семени и эмбрионов в целях воспроизводства

1. Якутский скот используется в целях воспроизводства, восстановления его численности, если:
а) обозначен мечением или иным способом, позволяющим точно его идентифицировать;
б) зарегистрирован в государственной генофондной книге якутского скота или на него имеется сертификат (свидетельство).
2. Семя и эмбрионы якутского скота используются в целях разведения, если:
а) получены от животных, зарегистрированных в установленном порядке в организации по искусственному осеменению или трансплантации эмбрионов;
б) имеют четкое обозначение в целях их идентификации;
в) на них имеются сертификаты (свидетельства).

Статья 13. Бонитировка якутского скота

1. Бонитировка якутского скота проводится ежегодно во всех организациях, крестьянских хозяйствах и личных подсобных хозяйствах граждан, содержащих якутский скот.
2. Порядок и условия проведения бонитировки якутского скота устанавливаются государственной племенной службой.

Раздел IV. Государственная поддержка охраны, использования и развития генофонда Якутского скота

Статья 14. Финансирование работ по охране, использованию и развитию генофонда якутского скота

1. Финансирование работ по охране, использованию и развитию генофонда якутского скота осуществляется за счет средств республиканского и местных бюджетов, внебюджетных источников и обственных средств.
2. В государственном бюджете Республики Саха (Якутия) ежегодно предусматриваются средства на:
а) содержание поголовья якутского скота – собственникам (владельцам) якутского скота;
б) закуп животноводческой продукции, произведенной собственниками (владельцами) якутского скота;
в) реализацию государственной программы по охране, использованию и развитию генофонда якутского скота, а также на научные исследования;
г) исполнение государственного заказа на научное обеспечение охраны, использования и развития генофонда якутского скота.
3. Финансирование работ по охране, использованию и развитию генофонда якутского скота осуществляется в соответствии с положением, регулирующим порядок выплаты средств на эти цели в пределах, предусмотренных в республиканском бюджете на очередной финансовый год по разделу 0800 "Сельское хозяйство и рыболовство".

Статья 15. Налогообложение физических и юридических лиц, занимающихся разведением якутского скота

Физическим и юридическим лицам, занимающимся разведением якутского скота, устанавливается льготный порядок налогообложения в соответствии с законом о налоговой политике Республики Саха (Якутия) на очередной финансовый год.

Статья 16. Льготное кредитование

В целях создания условий для производства и реализации сельскохозяйственной продукции физическим и юридическим лицам, занимающимся разведением якутского скота, в республиканском бюджете предусматриваются средства для льготного кредитования.

Раздел V. Научное обеспечение охраны, использования и развития генофонда Якутского скота

Статья 17. Научное обеспечение охраны, использования и развития генофонда якутского скота

1. Научное обеспечение охраны, использования и развития генофонда якутского скота осуществляют научные учреждения, занимающиеся проблемой сохранения генофонда сельскохозяйственных животных.
2. Задачей научных учреждений, занимающихся проблемой сохранения генофонда сельскохозяйственных животных, является разработка научно-обоснованных систем сохранения, совершенствования

продуктивных и племенных качеств якутского скота, а также эффективного использования в селекции его генофонда.

Статья 18. Финансирование научного обеспечения охраны, использования и развития генофонда якутского скота

Правительство Республики Саха (Якутия) устанавливает государственный заказ на научное обеспечение охраны и использования якутского скота, а также предусматривает на эти цели средства отдельной строкой в республиканском бюджете.

Раздел VI. Ответственность за нарушение настоящего закона

Статья 19. Ответственность за нарушение настоящего закона

Руководители организаций любых организационно-правовых форм, физические лица, а также должностные лица государственных органов и органов местного самоуправления несут материальную ответственность за нарушение настоящего закона в соответствии с действующим законодательством.

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Spaces of Conservation of Local Breeds: The Case of Yakutian Cattle

Katriina Soini,* Ulla Ovaska and Juha Kantanen

Abstract

The loss of farm animal genetic diversity became a major environmental issue during the course of the twentieth century. Numerous indigenous farm animal breeds have been replaced by commercial breeds alongside the modernisation of agriculture across the world. Indigenous farm animal breeds are mainly raised in marginal agricultural areas. Yakutian cattle are an indigenous Siberian cattle breed in the Russian Far East, which have a low output, but valuable characteristics that confer adaptation to the northern environment. This article identifies and analyses various spaces of conservation of the cattle, examines the power relationships within and between these spaces and discusses their implications for governance. The conservation of Yakutian cattle is embedded in the international agenda, which has been partly adopted by the Russian Federation. However, it is the Republic of Sakha and the Yakutian Institute of Agricultural Research that organise the conservation of Yakutian cattle de facto based on the law. The local communities in the Eveno-Bytantay district are responsible for practical conservation work in private households and the state [farm] enterprise. We suggest that although the cattle seem to be safeguarded, the current conservation policy does not support sustainable conservation in the long term.

Introduction

Local farm animal breeds[1] comprise a very specific group of farm animals. Due to their breeding history they are usually genetically diverse and have traits that are not found in more recently developed breeds (see Food and Agricultural Organization [FAO] 2007, pp. 5–18). The modernisation of agriculture has dramatically reduced the number of these breeds and their future is also uncertain, as about one-third of all animal breeds are now considered to be threatened with extinction (Ruane 1999; Tisdell 2003; Scherf 2005; FAO 2007).

However, there are many reasons why local breeds should be preserved and conserved[2] (Notter 1999; Gandini and Villa 2003; Mendelsohn 2003; Verrier *et al.* 2005; FAO 2007; Oldenbroek 2007, pp. 19–22; Soini 2007): Local breeds may carry special genetic features and adaptive traits, such as resistance to diseases and adaptability to varied and even extreme environmental conditions, which might be valuable

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for animal breeding and food production in the future (Mendelsohn 2003, Rege and Gibson 2003; FAO 2007; Oldenbroek 2007). They serve in food production in marginal agricultural regions and also as convertible assets that are available and easily traded. They have therefore been associated with sustainable livelihoods (Anderson 2003; Granberg *et al.* 2009). Some local breeds have good abilities in grazing, and thus in landscape and biodiversity management (Sæther *et al.* 2006; Verrier *et al.* 2005). Moreover, in western societies in particular, local breeds have recently been considered as a part of sustainable rural development or multifunctional agriculture through the provision of social and cultural services and rural entrepreneurship (Yarwood and Evans 2000; Light 2004; Soini 2007). It can be argued that local breeds represent a special form of 'rural capital' in both developing and more advanced societies.

New geographies of local breed conservation

Various international conventions and declarations, including the Declaration on the Protection of World Natural and Cultural Heritage (1972), the Global Biodiversity Strategy (1992) and the Convention on Cultural Diversity (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2005), establish the very basis for the conservation of local breeds and cultures closely associated with them. It is now widely agreed that local communities are of crucial importance for the conservation of local biodiversity and that local cultural values and practices as well as indigenous rights should be considered in conservation policies. The implementation of conservation should consist of community-based and participatory approaches rather than top-down ones (United Nations Environment Programme [UNEP] and UNESCO 2003; FAO 2003). However, biodiversity is not only a local issue but also a national and global one. The conservation of local breeds therefore needs to be seen as an interplay between various actors, institutions and policies engaged with the breeds at different levels and sectors. Their conservation is about managing the relationships between levels, sectors and actors; it is about the governance of conservation.

As Karl Zimmerer (2006, pp. 1–7) noted, globalisation has resulted not only in a decrease in biodiversity but also in the growth of environmental globalisation and globally organised conservation management institutions, knowledge systems, monitoring and conservation strategies. He suggests that spatiality should be taken into proper consideration in biodiversity conservation. According to Zimmerer, spatiality helps us to see environmental spaces and configurations, where the physical extent is fused with the social intent (2006, p. 9). Spatiality results from various forces, including scientific ideas about biodiversity, social power and governance authority.

Spatiality has many implications for conservation policies. Firstly, certain scales and networks do not necessarily correspond to the prescriptions of currently predominant policies that are framed according to social units such as individual communities or economic sectors such as agriculture. Secondly, conservation issues often transcend boundaries of single countries and regions. Thirdly, the decentralisation of conservation has become a keyword. Although decentralisation can be seen as a

democratic aim, incorporation of the local actors in the policy implementation easily increases the complexity of conservation due to various power relationships. (Zimmerer 2006, pp. 8–11)

Following Zimmerer, understanding conservation requires attention to its spatial scales and to the horizontal and vertical linkages between them (see also Young 2006). Cross-level and cross-sectoral interactions among environmental and resource regimes are scale dependent (Young 2006). This implies that perceptions of the origins and character of an environmental problem and its solutions do not always meet at different levels, resulting in attitudinal and behavioural differences and difficulties in finding socially and culturally acceptable conservation policies (Ingold 2000; Berkes 2004, Young 2006; Görg 2007). Thus, identifying and analysing the spaces where the conservation issue occurs is argued and negotiated provides a critical basis for developing the governance of conservation (Young 2006; Zimmerer 2006).

In the far east of Siberia there are small populations of Yakutian cattle, which are the only surviving cattle of Eurasian humpless taurine cattle type (Kantanen *et al.* 2009a). Recent research has revealed that Yakutian cattle have high genetic value. Besides their genetic value, the cattle have constituted an important part of the local livelihood system for centuries (see Crate 2006; Granberg *et al.* 2009; Maj 2009). There have been attempts to conserve Yakutian cattle since the 1950s, unlike many other local breeds under threat of extinction. Currently, the cattle are conserved by law and this is subsidised by the Republic of Sakha. However, the changing institutional and political environment, as well as the globalisation and modernisation of the way of life, constitute a continuous challenge to the general livelihood system in the region and for the future conservation of Yakutian cattle (see Berkes 2004).

The ultimate aim of this article is to examine the spaces of conservation of Yakutian cattle in the context of new geographies of conservation. We will firstly analyse the spaces of conservation, that is, how the conservation of the cattle breed is argued at the global, federation, republic and local levels and in the media. Secondly, we will examine what kind of power effects are to be found between the various spaces and actors related to this conservation. Finally, we will discuss the preconditions and limitations for the governance of the conservation of Yakutian cattle, particularly with respect to the three models of governance identified by Kooiman (2003).

Yakutian cattle in the three villages of the Eveno-Bytantay district

The Yakuts migrated[3] with their horses and cows in several waves to the central Yakutian regions after the ninth century, introducing the tradition of raising cattle to these northern areas, which were traditionally settled by peoples living by reindeer herding and hunting. The Yakuts practiced transhumance, moving from winter-time dwellings to summer pastures, following the needs of their cattle and sharing their houses with the animals (Basharin 1962; Kopoteva and Partanen 2009).

Until the 1930s native Siberian cattle existed throughout central Sakha, but collectivisation brought changes to cattle husbandry. During the first decades of the Soviet era there were experiments to improve the productivity of Yakutian cattle. The

attempts failed due to restricted feeding possibilities. However, the replacement of Yakutian cattle with more productive animals reduced the numbers of the original breed. By the late 1950s Yakutian cattle only existed in the remote northern territories where the transport connections were poor and distances long (Romanov 1959, 1984).

Currently, a population of about 1000 head of Yakutian cattle exists in three villages in the Eveno-Bytantay district, Batagay-Alyta (Sakkyryr), Kustur and Dzhargalakh. These are located above the Arctic Circle, approximately 1000 km to the north of the capital of the republic, Yakutsk. The total population of the Eveno-Bytantay district was 2778 people in 2007. Most (63 per cent) were living in the administrative centre of the district, Batagay-Alyta. The main source of income was social services and agriculture (cattle, reindeer and horse breeding), constituting about one-fifth of the total employment. Since the collapse of the Soviet Union most of the cattle (68 per cent) have been held on privately owned subsidiary farms. The reminder were owned by the state-owned enterprise Bytantay (22 per cent), by tribal people (6 per cent) and private farms (4 per cent). Some cattle have been located since the mid-1990s on a state-owned farm in the Gorny district and on a private farm in the Amginskiy district. (Kopoteva and Partanen 2009)

Data and methods

Our analysis aims to investigate the sociocultural and political spaces of conservation of Yakutian cattle that are transmitted through arguments concerning the distinct values of the animals and reasons for their conservation (see also Soini and Partanen 2009; Ovaska and Soini 2011). The research material was collected during a field trip in 2005 by a multidisciplinary research group.[4] The data consist of various documents on the history of Russia and in particular of Siberia, the modernisation of agriculture and the emergence of environmental awareness related to animal genetic resources. We have also used contemporary literature written by scholars who were already engaged in the conservation of Yakutian cattle during the Soviet era, as well as political programmes and laws enacted by the United Nations (UN), the Soviet Union, the Russian Federation and the Yakut Autonomous Soviet Socialist Republic (ASSR) or Republic of Sakha. In addition, 71 interviews were conducted during the fieldwork in 2005.

Three distinct groups of people were interviewed: Firstly, local residents, who either had a subsidiary farm or worked on the state farm and had considerable experiential, traditional or local knowledge related to cattle husbandry, and also other residents who worked in other occupations and who did not have any cattle themselves. Secondly, we interviewed specialists and experts in the local administration and in cattle breeding, production or research. They can be termed local certified experts,[5] whose main concern was how to organise and develop cattle husbandry in the district and to meet all the technological, financial and social requirements, and also conduct the scientific experiments required by the republic. Thirdly, researchers, politicians and administrators in Yakutsk, who perceived the issue from the republic's, and even a wider point of view, but were not necessarily very familiar with the realities of the three distant villages were interviewed. We assume that the attitudes of the interviewees are intertwined both in the direct and indirect social

and cultural contexts as well as in the individuals presenting them (Vesala and Rantanen 2007, 54). The interviews were conducted in Russian and translated into English.

In addition, newspaper articles published by two Sakha newspapers in 2003–2005 were analysed: *Yakutia* (Y), published in Russian, and *Sakha Sire*, published in Yakutian and translated into Russian by local students. The research material included newspaper articles dealing with Yakutian cattle and the current development of traditional agricultural livelihoods in the Republic of Sakha. Representations by the media were examined using text analysis, and the results are considered here in a wider societal context.

The spaces of conservation of Yakutian cattle

Global biodiversity policy framing the conservation

The first steps towards the conservation of Yakutian cattle took place in the frames of global biodiversity policy in the early 1970s as the erosion of farm animal genetic resources attracted international attention. The UN Conference on the Human Environment, held in Stockholm in 1972, recognised that conservation is the most crucial part of any genetic resources programme, and the conference therefore recommended that governments, in co-operation with the Secretary General and the Food and Agriculture Organization (FAO) of the UN, make inventories of the genetic resources most endangered by depletion or extinction (United Nations Environment Programme 1972).

The All-Soviet Research Institute of Animal Breeding and Genetics carried out an inventory of farm animal breeds that were either endangered or at risk of becoming endangered in the Soviet Union in the mid-1970s. One of the cattle breeds included on the list was the Yakutian cattle, comprising 300 dairy cows. In general, the situation facing many indigenous cattle breeds in the Soviet Union was considered to be dire, and valuable features and unique resources were in danger of disappearing. Recommendations were therefore made to conserve the genetic resources of the endangered farm animal breeds (Romanov 1984, 10–11). The aims of the conservation policy were twofold: to support regional policy and to utilise the genetic resources of Yakutian cattle in breeding.

Agricultural experts drafted a research programme to address the problems associated with farm animal genetic resources in the mid-1970s. The task of the programme was to define the unique features of endangered indigenous breeds, to make recommendations for the conservation of local breeds for their utilisation as genetic resources and to find effective ways to use the genetic variation. The recommendations were based on a classification that divided cattle breeds into three categories. The first category included native cattle breeds that had unique features and were endangered. The second comprised valuable local breeds that had rapidly diminished and the third consisted of other local and imported breeds. Yakutian cattle belonged to the first category. The idea was to create special farms for each category in order to keep the indigenous breeds pure and to organise sperm cryobanks for future breeding experiments (Ministry of Agriculture, Yakutian State

University and All-Union Research Institute of Animal Breeding and Genetics 1981; Romanov 1984, 9–11, 17–19).

Moreover, an all-Soviet conservation programme called *Genofond* (from 1981), which dealt with the conservation of animal genetic resources, included a special part in which attention was paid to the situation of Yakutian cattle (Ministry of Agriculture, Yakutian Sate University and All-Union Research Institute of Animal Breeding and Genetics 1981; Romanov 1984, p. 11). In connection with this programme the Yakut ASSR drew up regulations for the artificial insemination of Yakutian cattle (Ministry of Agriculture, Yakutian Sate University and All-Union Research Institute of Animal Breeding and Genetics, p. 5).

Soviet genetics researchers legitimised the conservation of Yakutian cattle on the basis of international development in the conservation of genetic resources (see, for example, Romanov 1984). This was possible due to the continuous problems faced by Soviet agriculture and its modernisation process in terms of, for instance, productivity. The small size of the cattle had earlier in the modernisation process only been regarded as an undesirable attribute (Smith 2006, 81).

In the eleventh 5-year plan of the Soviet Union from 1981 to 1985, no special attention was paid to the conservation of animal genetic resources. Nevertheless, the plan highlighted the role of science and technology in addressing the challenges of increasing productivity (Communist Party of the Soviet Union 1981a, pp. 45–53.). In the late 1970s and early 1980s, agricultural productivity decreased. It was argued that, among other issues, one of the reasons for this was the poor state of animal breeding in the country (Naukhatsky 1996, pp. 60–61, 65, 116, 123). The Soviet Union aimed to improve and intensify agricultural production by creating new farm animal breeds of high quality in terms of production and efficiency. The special aim of agricultural production in Siberia was to provide local people with local food and to promote self-sufficiency (Communist Party of the Soviet Union 1981a, 1982, 55–57, 64). However, the coming years did not bring any major relief to the difficult agricultural situation, and in 1989 Mikhail Gorbachev admitted that reform was desperately needed (Central Committee of the Communist Party of the Soviet Union 1989, 7–10).

The question of animal genetic resources advanced internationally as the FAO developed activities in co-operation with UNEP during the 1980s (Wiener 1989). The next important international milestone in the conservation of farm animal genetic resources was the Earth Summit in Rio de Janeiro in 1992, in the same year in which the Soviet Union was officially dissolved. One of the aims of the conference was to encourage nations to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity, which were included in the Convention of Biodiversity (CBD). The Russian Federation ratified the CBD in 1995, which enabled and obliged its subjects to take care of their environment and resources. In 2002 the Russian Federation enacted the Federal Law on Environmental Protection, which defines the roles of different subjects of the Russian Federation in nature conservation (Russian Federation and the Republic of Sakha 1995; Silfverberg *et al.* 2004, pp. 14–16). The sovereign subjects in the Russian Federation have the initiative when it comes to conservation activities, whereas the republic is the main implementation body.

Implementation of conservation activities by the republic

The Republic of Sakha has worked for the conservation of the genetic resources of the cattle breed within the frameworks set out by the civil servants of the Federation and encouraged by the scientific community and politicians. The key actors at the republic level have been the administrators in the Ministry of Agriculture, the Agricultural Research Institute in Yakutsk and the Sakha Insemination Organisation (Local administrator and local expert, interviews 1 and 8). It also appears that the presidents of the republic have played an important role in the conservation effort, at least according to the interviewees, as the following extract shows:

> So, starting from [the President of the Republic] Shtyrov ... the minutes read: Yakutian cattle should not be subject to commercial activities but to research. After these words we got state support for all our initiatives. (Administrator in Yakutsk, interview 27)

Substantial action was taken in the 1980s when a research station for Yakutian cattle was established in Batagay-Alyta in the 1980s. The privatisation of agriculture, which started in the late 1980s and accelerated in the 1990s at the federal level, has been an important part of this conservation. At the time of the privatisation process Soviet state authorities were losing their influence and the former chairmen of collective farms mainly held knowledge on the new legislation designed at the federal level (Lindner 2006). This was also the case in the district of Eveno-Bytantay, where the state farm collapsed in 1993–1995 and gatherings were organised for the local people to discuss the matter with the administration. The animals were to be divided among the people according to their years of service and older people, together with some local administrators, were therefore mainly in favour of dividing the cattle (Local expert, interview 5). As noted above, the importance of Yakutian cattle had been recognised at the republic level and the breed was saved, although great numbers of farm animals had been slaughtered in connection with privatisation. According to Granberg and Kopoteva (2009), the people in favour of conserving the cattle breed at republic and local levels probably influenced the decision:

> They were about to [divide the cattle]; first they divided reindeer, then horses. It became clear that as soon as they had divided the reindeer, there were none left. They divided horses and there were no horses left.... Yakutian cattle as a genestock was protected from being ruined. They tried to keep the bloodstock.... [I]t was possible to divide [them up] if there was a great desire. But as they say, if you divide bloodstock ... (Local expert, interview 8)

Some of the cattle were transferred to southern parts of the Republic of Sakha by the republic and the scientific community to form a living gene bank for research purposes and to secure the maintenance of their genetic resources.

In 2001 the Republic of Sakha enacted a law on the conservation and use of cattle. The Ministry of Agriculture and the Agricultural Research Institute prepared the law together and it elevated the Yakutian cattle to the status of an endangered breed (Researcher in Yakutsk, interview 67). The aim of the law was to promote the genetic diversity of the breed, keep the breed pure and preserve it for future breeding. It contains regulations concerning the insemination, registration and farming of the cattle as well as financial support for the public and private farms that keep Yakutian

cattle and for scientific research on the breed. The financial support is directed to the animal keepers according to the number of cattle they manage. In addition to direct support, the support system includes buying the meat and milk products of the cattle. The law guarantees both tax and credit privileges to the farms. The research is intended to be financed by the republic, using local budgets together with income from the farms (Republic of Sakha 2001). The law is unique, even in the global context.

The conservation programme included in the law is formally part of a federal programme that aims at developing rural areas, although it works on the republic level (Administrator in Yakutsk, interview 65). The Ministry of Agriculture in Sakha initiated the funding for the conservation process and supports the Agricultural Research Institute in taking care of the practical responsibilities. There is a branch for each district in the Ministry of Agriculture that is responsible for accounting and budgeting for cattle and reindeer production (Local administrator, interview 1).

At the level of the republic, many of our interviewees considered that the main objective of conservation was to preserve the animals' genetic resources to be exploited in cattle breeding. Agricultural production should be increased in the republic, and Yakutian cattle represent valuable material for cross-breeding:

> Our scientific dream is to increase the breed's census size so that it will not disappear. We will combine the productivity of milk breeds and the sustainability of Yakutian cattle to produce a new breed, which will be highly productive in our conditions. (Expert in Yakutsk, interview 27)

The conservation of genetic resources should therefore be ensured in order to be able to focus on the development of production. The experts favoured *in situ* conservation in the district of Eveno-Bytantay based on genetic arguments. They believed that the distant and isolated location would guarantee the purity of the breed. In addition, the long history of cattle breeding within the same geographical area was respected from the genetic point of view. The cultural value of Yakutian cattle was also recognised. Many researchers and politicians were Yakuts themselves. For them, the cattle represented a traditional way of life and a cultural heritage, a relic from the history of the Sakha people. The cattle were seen as a means to preserve and strengthen the cultural identity of Sakha people.

In this way, the experts in the capital city viewed the villages as 'conservation territories' (Zimmerer 2006, p. 8), the socioeconomic development of which should be taken care of:

> Let's assume that if there is no good boiler house, kindergarten, school, cinema or a club in the Eveno-Bytantay district and in Batagay-Alyta, there will be no life there, and there will be no production. As all these things are there, there is production. Our children love their nature, and they don't long to leave; they live and work there, and they like nature. (Leading politician in Yakutsk, interview 29)

They were to some extent worried about the current conditions of the villages: the high rate of unemployment related to many social problems and weak infrastructure. They had also recognised that it was not possible to increase the numbers of cattle in Eveno-Bytantay because of the limited hay production, revealing the biophysical

constrains for conservation (Zimmerer 2006; Görg 2007). The cattle are fed with natural hay grown in the district (see Granberg and Kopoteva 2009).

Local communities between the regulations and local realities

The local scale is the space where conservation actions take place in practice by local residents, cattle keepers, local administration and extensionists. It is the most crucial but at the same time the most complicated space of conservation (Görg 2007).

The most obvious reason for local residents to maintain Yakutian cattle has been their direct use in local food production by providing milk and milk products such as cheese, yoghurt and butter. In addition to foodstuffs, the cattle have also provided other products and services to the local community, for example manure for the construction of cow houses and as a fertiliser for greenhouses and gardening.

As the cattle have constituted an important addition to the total household income, it is no wonder that the introduction of subsidies for milk and credits for buying cattle has made many people from various social groups start breeding cattle.

> We keep cattle due to this support. If there were no support, most private people would refuse to keep cows. (Local administrator, interview 41)

Various incentives have been introduced for cattle husbandry since the mid-1990s (Local administrator, interview 25). For example, as a part of the social and economic development programme, private individuals have also had access to microcredit and cash to buy young stock, reindeer and cattle. Enterprises and private people make agreements with the procurement company Tyumsyu, and they receive support for selling milk and meat (Local administrator, interview 25). Finally, subsidies have been paid by the government for keeping the cattle and selling milk (Republic of Sakha 2001). We were told that the current level of subsidies ranged from 1500 to 3000 roubles per cow (Local residents, interviews 3 and 4). The support system was still in its early stages at the time of the study and it was still not entirely clear to everybody. Neither were people very confident in the future of the system.

The additional income the local residents received from cattle products was used for exchanging or purchasing other goods and services they needed acutely, but also for ensuring a better future for their children. Thus, the cattle seemed to provide an additional income but also a sort of long-term social insurance for the whole family (see also Anderson 2003).

Cattle production also covered many social fields such as local employment, social status, social cohesion and social inclusion and exclusion. These contributions have been recognised by a local expert:

> If our production is not supported and we are left with only subsidies, like American aborigines confined to reservations and left with nothing to do but just getting something for free, then our people will just ruin themselves with alcohol. When people have an occupation, it is easier for the people to live, although it is tough. I think so. We are also aborigines. (Comment by local expert, interview 2)

However, there were also social problems related to the work with the cattle in terms of difficult working conditions in private households and the state farm. The state

farm also had problems with the delayed payment of salaries in the mid-2000s, which resulted in the reduced wellbeing of the cattle. The poor condition and poor level of mechanisation of the cowsheds and lack of mechanical devices for haymaking caused problems:

> The main thing here – if we take animal breeding – is construction. Cowsheds need to be built. At the least we need self-filling drinkers and feed distributors. And it would be good to have dwelling houses nearby. Then people will come. (Local expert, interview 26)

Although there were some ideas for developing the production technology and working conditions, the government and the Agricultural Research Institute were primarily interested in the conservation and preservation of the cattle, not in the development of production. This particularly concerned the state enterprise, which was criticised by a local expert:

> It used to be a production enterprise; now they intend to hand it over to scientists and the latter want to keep them only for preservation of the breed, but not for production. (Local expert, interview 8)

The effects of cattle production extended to the kin of producers and the local community at large (see also Crate 2006). Milk products and meat were delivered to family members, who in turn helped, for example, in haymaking and cow management:

> We eat meat with all our relatives. And she [his wife] gives it to her friends.... She gives it to the people who provide services to her. (Local resident, interview 2)

Much of the work related to cattle breeding, such as haymaking, hay transportation, the construction of cowsheds and the organisation of grazing, brought the members of the family and the local community together. At the local community level, cattle husbandry was not very closely related to any particular social class. As Crate (2006) notes, after the collapse of the Soviet Union the elite was not much wealthier than the workers; everyone was looking for ways to supplement their livelihoods. Working together, co-operating in various phases of work and the allocation of material resources and know-how contributed to the establishment of formal and informal networks, which is of crucial importance for the formation of social capital and biodiversity conservation, as Pretty and Smith (2004) suggest.

Cattle husbandry represented the relationships between individuals and the household. Milking, cleaning and watching over the cattle were jobs that were typically carried out by the women, sometimes with the help of family members who lived at home. Although men were usually involved in other jobs, their contribution to cattle husbandry was needed in the making and transportation of hay and in the cleaning of cowsheds (see also Pääkkönen 2009). Cattle production has also been responsible for both setting and crossing borderlines between the main nationalities, the Sakha and the Eveny. Traditionally, reindeer farming was mainly a livelihood of the Eveny, and cattle and horse farming that of the Sakha, but many Eveny have recently also started to keep cattle. Cattle were sometimes used as a manifestation of Yakutian culture by our interviewees, although horses have the highest symbolic meaning in Yakutian culture (Maj 2009; Pääkkönen 2009).

The local experts considered Yakutian cattle as local cultural property or 'capital', which gave them a certain status among the rural districts in Sakha:

> We are the only area to have preserved them. If we had not preserved them there would be no gene pool at all. (Local administrator, interview 41)

The genetically unique cattle were also of strategic value to the district. Some of the interviewees tended to think that the cattle represented their right to exist and live in the district. For these reasons, many of the experts considered that the cattle that provided them this status and right should not be allowed to benefit other districts. Furthermore, some of the interviewees talked about the long common history of the cattle and the Sakha people that they wished to continue. The local residents recognised the value of the cattle for their personal identity and the identity of the Eveno-Bytantay district. They regarded the cattle as being something of their own, making them different from other people and other villages.

The role of the cattle in local food culture and gastronomy was important. The diet of the local people included milk products, particularly during the summer, and cattle meat. The cattle products have persisted partly because there has been no real choice. Nevertheless, the local people emphasised the gastronomic characteristics of the milk and meat products of Yakutian cattle, in particular the taste of the meat and fat content of the milk, suggesting its health effects. There are already some promising examples of the commercialisation of milk and meat products from local breeds in other countries, such as Reggiano cheese in Italy. Similarly, some of the local experts in Eveno-Bytantay had plans to create quality products based on the unique characteristics of the cattle and market them nationally and even internationally. However, they admitted that due to the low level of milk production, poor transportation and weak social infrastructure, niche production would not become a reality in the near future.

There was traditional oral knowledge related to cattle breeding and, for instance, building a cowshed suitable for local conditions. It could be argued that culturally embedded local knowledge constitutes an essential part of the memory bank (Nazarea 1998) that is needed for the conservation of genetic resources in the district.

The landscape of present-day villages is strongly affected by cattle husbandry. There we see cowsheds, grazing lands, manure stocks, haystacks and fences, as well as the cattle themselves frequently walking along the roads. The cattle are a part of the everyday life of the local community and belong to the physical landscape. The cattle were a strong part of to the memories of the older people dreaming about life outside the village of pre-collectivisation times: when people lived along the riverside with their cows, close to the good grazing lands and nature. The cattle break not only the spatial, but also the temporal boundaries, at least between the past and present. However, cattle husbandry did not necessarily belong to the future dreams of younger residents; it was seen rather as a necessity or destiny, not only by the youngsters themselves but also by their parents (see also Pääkkönen 2009, 72).

The social and cultural values related to cattle have somewhat contradictory implications at the local level: cattle production is based on traditional technology and the working methods and conditions are often physically demanding and primitive. On the one hand, the modernisation of cattle husbandry might constitute a threat to the preservation of cattle. On the other hand, there was a fear among the experts that the

younger generation is no longer interested in cattle breeding due to the primitive production culture (see also Pääkkönen 2009, 72). In this way, our case study confirmed the complex challenges of combining conservation and development (Berkes 2004).

The economic significance of Yakutian cattle for local livelihoods and the subsistence economy is undeniable, although the cattle also had many social and cultural values. The residents had increasingly become aware of the genetic value of their cattle, and some of them are even morally committed to their conservation. It can also be assumed that the local people have had an intuitive understanding of the suitability of the cattle to the local ecological conditions and the need to conserve them in the future for this reason (see Berkes 1999, 28–35). Nevertheless, the biodiversity value of the cattle *per se* was not the issue for them and the future of the cattle might be uncertain if the local livelihood system changes dramatically.

Representation of cattle and their conservation by the media

The media plays a significant cultural and social role, as it produces and transmits different public awareness messages. It also reflects the societal reality and common currencies already existing in society (McQuail 1992; Kunelius 2001). The media can additionally provide critical space in environmental governance and may popularise environmental problems and management options, and encourage debate on solutions. The media can also provide legitimacy for the results of policy and public praise for those who have achieved the policy objectives and monitor the governance regime to catch out cheats, free-riders and obstructionists (Sampford 2002).

In Russia the major sources of information in the regions are the local and regional media. They are mainly concerned with local problems that are not dealt with by the federal media (Zassoursky Y. 2001, pp. 180–182). The conservation of Yakutian cattle has been a frequent topic in the local newspapers at the beginning of the 2000s. It has been closely connected to the future of agriculture in remote northern areas. Nevertheless, the main concern of the newspapers seems to be reindeer herding, its problems and its economic influence on the northern areas and on the survival of the indigenous peoples and their traditional lifestyles. Articles on Yakutian cattle have focused on the conservation of the breed and its economic, cultural and genetic significance, as well as on the situation of farming in the republic in general. The articles have been written in connection with current events, and both the local newspapers have adopted the role of criticising the authorities and defending the local people.

The newspapers were highly supportive of the idea of preserving Yakutian cattle in order to improve cattle production in Sakha, but it was uncertain how the conservation should be financed. It was known that the keeping of Yakutian cattle was not economically profitable. The state farm was in a deep economic crisis, although it was already at that time partly financed from the republic budget:

> The expenses of Yakutian cattle are bigger than the income ... the cattle have no significance as milk producers ... (Y 19 June 2004).

Yakutian cattle were the only cows that could be kept in the far north, because they were the only breed that could survive in the harsh climate with poor nourishment. The output of the cattle breed was low, but the newspapers nevertheless acknowledged that the cattle keep the area settled by enabling the residents of small villages to remain in their homes:

> The most important argument for the conservation of Yakutian cattle and their utilisation in cattle breeding is the fact that we have vast territories where the intensification of cattle production is difficult because of climate conditions. (Y 29 November 2004)

Yakutian cattle, their genetic resources and survival in the harsh conditions of the Eveno-Bytantay district were well reported by both the newspapers examined. The immediate extinction of the breed had been avoided and the cattle were going to be saved because of their genetic resource value for future breeding (Y 29 November 2004, Y 29 November 2004). The harsh working and living conditions of the north were also noted by the newspapers. The lack of machinery and financial resources, as well as excessive bureaucracy, were marked problems in developing and maintaining traditional livelihoods in the northern areas (see, for example, Y 19 November 2003, 28 January 2004, 3 February 2004, 8 February 2005).

According to the newspapers, the Sakha people regarded Yakutian cattle as a national heritage. Although Yakutian cattle have had an effect on Sakha culture, history and civilisation, the Yakutian horse was held in still higher regard in the newspapers. This is probably due to its important position in Sakha religion, myths and legends, in addition to its practical value as a source of meat and milk and as a means of transportation. Cattle are not of similar importance in ancient religions, but their value and common history with humans have been approximately the same. The influence of cattle on Sakha culture and the civilisation process of remote eastern areas were still acknowledged, even to the extent that the newspapers thanked Yakutian cattle production for bringing culture and civilisation to the north:

> These are indeed the first people in history that have kept cattle and horses in the far north. There are no other people in the whole world who have been able to manage cattle production in such extremely hard conditions. (Y 20 July 2004)

According to the media, the most significant achievement of the Sakha people is that they created their own culture of horse and cattle production, and that the severe conditions created the unique Yakutian cattle. The newspaper argued that the Sakha people have created their own, self-sufficient methods of meat and milk production, which are adapted to the local conditions. The Sakha people brought to the far north a civilisation that is based on livestock production (Y 20 July 2004). This viewpoint is interesting, because the conquest and modernisation of the north, as well as the civilisation of its peoples, have been praised and used for propaganda purposes by the conquering nations. The northern peoples themselves have not often been respected in history (Möller and Pehkonen 2003, p. 3). The Sakha people have apparently adopted the role of the people who civilised the north, at least in the newspaper articles. In the current post-Soviet era, the Sakha people are generally rediscovering their ethnic roots and cultural traditions, thereby strengthening their ethnic identity (Jordan 2002, pp. 260–261).

Furthermore, the cattle were often mentioned in the newspapers as a cultural heritage of the Sakha people and the basis for any improvements planned by the administration. It is possible that the cultural meaning and its emphasis is the easiest way to convince ordinary people about the importance of conserving the cattle. In addition, it was probably meant to result in a protective attitude towards the cattle among the citizens, and to raise their self-esteem and respect for their way of life. As Kunelius (2001, pp. 168–169) notes, the media is important in the process of constructing cultural, local and national identities, as it strengthens the feeling of togetherness among its readers. (Kunelius 2001, pp. 168–169).

Discussion

Conservation across spatial scales

Our study revealed that various spatial scales and networks participated in the conservation of Yakutian cattle. Furthermore, conservation crossed spatial scales and borderlines (see Young 2006; Zimmerer 2006, p. 10). International polices started to influence the conservation of animal genetic resources in the Soviet Union after the 1970s. However, the Soviet Union and later the Russian Federation have not played a very active role in the conservation of Yakutian cattle. They have been more concerned with either allowing conservation at the republic and local levels or preventing it. The Soviet Union instead affected the conservation of the cattle breed through agricultural policy, when it sought to replace unproductive indigenous cattle breeds with more productive ones. Although the power of international conventions to influence the conservation of genetic resources has remained relatively limited at the federal level, it has provided arguments for the scientific community for promoting conservation.

National governments are often the principal legal actors in environmental policy, because they are responsible for the organisation of resource spaces and environmental governance, and as they need to respond to pressure from a number of different actors (Speth and Haas 2006, p. 85; Zimmerer 2006, p. 11). Since 1992 the Russian Federation for its part has mainly provided a framework within which the conservation has been able to develop, by ratifying the CBD in 1995 and dividing power in the regions in environmental conservation and agricultural policy.

The Republic of Sakha has thus attained a key position in the conservation of Yakutian cattle. It has become the main financer of their conservation, not only because of the genetic value of the cattle but also due to its interest in developing remote areas and their agriculture, as well as attending to the cultural aspects of cattle breeding. The crucial element in this respect is the financial and political development of the republic with respect to the Federation. During the past decade the republics have lost some of their economic and political rights due to the centralisation process at the federal level (Jordan and Jordan-Bychkov 2001, pp. 5–8). At the same time, the northern parts of the Federation have lost their status as an ideologically important area and have become expensive areas to maintain (Möller and Pehkonen 2003, p. 3). Federal subsidies and Soviet-era social programmes, which had been important factors in the development of the northern regions,

have been removed (Jordan 2002, pp. 227–230). Against this background, it is evident that the republic will also be financially responsible for conservation in the future.

The local residents are the key actors in conservation. However, they have relatively little to say to the top-down conservation implemented from Yakutsk through the local administration. Their decision-making was bounded with the regulations of the current conservation programme and the subsidies that were paid for cattle production. The local people were seen rather as a means of conservation rather than as co-managers. The local administrators as well as the managers of the state farms put the conservation programme into practice but at the same time saw conservation as difficult due to the social problems related to cattle production and village development in general. Within the republic, the self-governance of districts,[6] including the Eveno-Bytantay district, has been recently introduced, implying that districts have complete control of the locally administrated budget. On the one hand, there is a fear that financial resources for conservation will diminish together with those for the district, because remote areas will largely be left to fend for themselves. On the other hand, the reform may provide new opportunities at the local level through increased financial autonomy.

The media criticised the administration and politicians in its articles and was suspicious of their intentions. Nevertheless, it highlighted the value of Yakutian cattle to local residents in terms of the possibility of making a living by breeding them, maintaining their cultural heritage and conserving the unique genetic resources of the breed. The long history of the Sakha people shared with their cows, as well as the role of the cattle as an economic asset for the future, undoubtedly brings additional value to the breed. It appears, however, that the genetic value and the economic benefits, such as subsidies, brought by the cows are the most important arguments in the conservation process as far as the regional newspapers are concerned.

The role of the non-governmental organisations, especially during the early stages of environmental policy processes, is to function as actors bridging the gap between scientists and policymakers and working with the media to bring issues to the attention of a broader public (Speth and Haas 2006, 92). However, in Russia, civil society is considered to be still in its initial stages, and environmental issues have been publicly discussed to only a limited extent. The initiators in the emergence of the Russian environmental movement have therefore been the 'intelligentsia', that is, people working in academia (Yanitsky 2000, pp. 42, 104, 253). In the case of Yakutian cattle, the importance of the scientific community and certain individual scientists in particular, in the development of conservation is also clear. The most often mentioned initiator of the conservation efforts was P.A. Romanov, who had been interested in the cattle breed and had been an active promoter of its conservation since the 1950s. He worked in the All-Soviet Research Institute of Animal Breeding and Genetics in the 1970s, which played an important role in taking the first steps in the conservation of farm animal breeds in the Soviet Union. His untimely death in the early 1980s made his symbolic role even more important. Later on, Dr Innokenty Ammosov, a local agricultural administrator and student of P.A. Romanov, who wrote a doctoral thesis on Yakutian cattle, was an important link

between the local and republic levels, having knowledge of the genetic value of the cattle as well as the local conditions where they were kept. In addition to scientists, the role of politicians, particularly presidents, was often referred to by the interviewed experts, in accordance with the important milestones of conservation.

Power effects of spatial scales

Our study revealed that all the actors seem to be in favour of conserving Yakutian cattle, but for slightly different reasons (see also Partanen and Kantanen 2009; Soini and Partanen 2009; Ovaska and Soini 2011). They also have different power positions in the frames of conservation. At present, the existence and conservation of Yakutian cattle is based on local and national interests rather than global ones, implying a commitment to their conservation that can be considered as a strength. However, conservation on a global scale is needed to safeguard the preservation of genetically unique cattle, if the regional and national economic or political situation changes dramatically in such a way that local livelihoods and the conservation of the cattle become unfavourable.

Despite the current tendency towards the decentralisation of conservation, the national level often prevails over the local level (see Zimmerer 2006, p, 11). This was also the situation here: the conservation of Yakutian cattle was strictly co-ordinated by the republic. Although the current form of policy seemed effective from the conservation point of view, questions of social welfare, equity or cultural autonomy (Young 2006) in relation to conservation and village development have remained untouched. Social welfare was discussed by the experts but mainly from the conservation point of view.

The positions of the different spatial actors are not necessarily very homogeneous: they also imply contradictory perceptions of the value of the cattle, which have different power implications. For example, at the republic level the aims of the scientific community and the administration are not necessarily the same. Similarly, the reasons for keeping the cattle differ among the local residents. Subsidies paid for cattle production are a powerful factor in conservation. If they are removed there will be an empty space for other forces to come into play.

The spaces of conservation and their relative power are not necessarily static. It is probable that particularly due to globalisation, the interaction between scales and actors will increase and the power relationship between the levels will change: Some spaces will become weaker, others stronger. It is also probable that new spaces for conservation will emerge. Our research project has certainly affected the conservation of Yakutian cattle by increasing awareness of the breed and its distinct values at international, republic and local scales (Li *et al*. 2007; Granberg *et al*. 2009; Kantanen *et al*. 2009b; Ovaska and Soini 2011).

Implications for the governance of conservation

The conservation of Yakutian cattle is a good example of multilevel governance. As we have seen, hierarchal governance (Kooiman 2003) and state intervention played a central role in the early phases of conservation of Yakutian cattle in the early 1980s,

when state farms for conservation were established. There was also a short phase of opposition and 'self-governance' at the beginning of the 1990s, when the privatisation of cattle production was launched. Self-governance refers to the situation in which people or groups are able to exercise all the necessary functions of power without any clear intervention from the authority (Kooiman 2003). In the case of Yakutian cattle, self-governance had a successful outcome: the cattle survived thanks to the local people and the scientific community that raised awareness of the values of the cattle before the collapse of the Soviet Union. An alternative result could have been possible.

Along with the conservation law and the introduction of subsidies in 2001, the role of the republic and top-down conservation has become stronger again. If the local people are seen primarily as a resource for conservation, it cannot be considered sustainable in the long term. There is therefore an urgent need for co-governance (Kooiman 2003), power sharing and participatory planning and joint decision-making in cattle production and conservation activities. Co-management presumes taking different motives into account, generating trust among various actors, which can be seen as useful considering the aims of conservation in the long term.

Multilevel governance is challenging in many ways. At its best, however, it may facilitate learning and adaptation in complex socio-ecological systems, where conservation is strongly linked to local development (Armitage 2008). In this respect, there is work to be done related to the conservation of Yakutian cattle. It has also been suggested that institutions that link the local-level actors with the national and international ones might be useful in multilevel conservation (Brown *et al.* 2005; Berkes 2004). In our case study, individual experts were already acting as links between various levels and spaces. However, institutional support for such cross-scale interplay might be beneficial.

Conclusions

Our case study on the conservation of Yakutian cattle clearly revealed the various dimensions of new geographies of biodiversity conservation identified by Zimmerer, particularly the spatiality of conservation. It also showed the challenges that these geographies bring for successful multilevel governance. The key question is how to integrate the global aims of biodiversity conservation with local development challenges in an efficient but democratic way. Our case study also showed how conservation is linked to societal transformation in rural areas and society at large. The transformation of Russian society provides a very special framework for the development of Yakutian cattle conservation.

Furthermore, our case study pointed out that the conservation of Yakutian cattle is deeply connected to local development and that all the spatial actors, from international to media, have a role in this process. The complexity that is caused by the diversity of these spatial scales cannot and should not be avoided. Rather, concerted efforts to improve the understanding of the complexity of cattle conservation and development are needed in order to take advantage of the opportunities provided by the different spaces.

Notes

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[1] Distinct concepts such as indigenous breeds and local breeds are used in describing breeds that are traditionally kept in restricted areas, have a long history there and carry locally specific traits. Although each of these terms has a special meaning or emphasis, they are used in this article as synonyms.

[2] Techniques for the conservation of animal genetic resources are generally divided into two main types: *in situ*, that is, the conservation of living animals, and *ex situ*, that is, cryo-conservation of genetic material such as animal semen and embryos. *In situ* conservation is widely preferred by researchers and conservation organisations (Gandini and Oldenbroek 2007, 34; FAO 2007). A third type of conservation, *ex situ in vivo*, refers to conservation through the maintenance of live populations not kept under normal farm conditions or kept outside the area in which they evolved or are now normally found, for example, zoos and farm parks (Oldenbroek 2007, p. 24).

[3] The migration trail of the Yakuts, and that of their cattle, is still shrouded in uncertainty, but the most common theory is that the people and their cattle came from south-west Asia or Mongolia and remained beside Lake Baikal for some time (Crate 2006, 43–48).

[4] The research team consisted of the following researchers in addition to the authors: Professor Leo Granberg (sociology), Lic. Sc. Inna Kopoteva (human geography), MSc, Eeva Pääkkönen (cultural anthropology), MSc, Anu Osva (artist).

[5] See, for example, Fischer (2000) for a definition of local and traditional or ordinary knowledge and Collins and Evans (2002) for certified and uncertified experts.

[6] The aim of the reform is to standardise the local governance system in the Russian Federation, to make the distribution of responsibilities and assets transparent and to promote local decision-making and democracy. The law was enacted in 2003, but its implementation has been challenging, mainly due to the lack of human and financial resources.

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Native Breeds as Providers of Ecosystem Services: The Stakeholders' Perspective

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ABSTRACT

The concept of ecosystem services (ES) has become a keyword in biodiversity conservation and policies but, until now, it has rarely been applied in the context of farm genetic resources. Intensification of agriculture with internationally marketed breeds has led to remarkable loss in animal genetic resources (AnGR). There is a need for sustainable and feasible policies to conserve and utilise the AnGR, which requires knowledge on how they are valued by different stakeholders. We apply the framework of ES as a communication tool to explore how different stakeholders perceive the AnGR, their values and benefits. The research is based on interviews of stakeholders active on different levels of conservation. Our results highlight the broad diversity of perceptions of the stakeholders interviewed. The AnGR are linked to all categories of ES and viewed much broader than could have been anticipated based on existing research literature. This can be seen as a strength concerning the ES policies since considering AnGR not only as a provisioning services gives an opportunity to bring them out of the 'margins' where they have still tended to belong. The research also confirmed the applicability of the ES framework as a communication tool for AnGR. We argue that the ES approach, which integrates both ecological and cultural aspects of conservation, can be seen as a great opportunity for conservation and sustainable use of AnGR, as AnGR are, on the one hand, results from the co-evolution of human and nature and, on the other hand, dependent on cultural values and practices.

KEYWORDS: ecosystem services, indigenous breeds, animal genetic resources, biodiversity conservation

1 Introduction

Native breeds are farm animals originating from, adapted to and utilised in a particular geographical region (FAO 2012). The breeds are of economic, scientific and cultural interest to humankind in terms of food and agricultural production for the present or the future (FAO 2007). Because of their genetic resources (AnGR), they constitute an important part of agro-biodiversity that consists of the variety and variability of animals, plants and micro-organisms that are used for food and agriculture (FAO 2016a). The continuous loss of AnGR is a global environmental challenge, and in particular, native breeds are in danger of becoming extinct. Hence, their conservation is essential to the maintenance of agro-biodiversity (FAO 2007).

Biodiversity and ecosystems are closely related concepts: biodiversity affects the amounts, speed and timing of the flows of energy and materials through ecosystems (UK National Ecosystem Assessment, UK-NEA 2016). It is widely agreed that the Ecosystem Services (ES) framework provides a new perspective for the conservation of biodiversity. ES are the benefits provided by ecosystems that contribute to making human life both possible and worth living (UK-NEA 2016). There are various ways to classify and categorise ES ranging from various products to ecosystem functions to aesthetic experiences and other cultural benefits (see e.g. Haines-Young and Potschin 2011; Fisher et al. 2009; Wallace 2007; Boyd & Banzhaf 2007; Kremen 2005; Millennium Ecosystem Assessment (MA) 2005). The ES expand the focus from single resources to the full array of contributions which ecosystems make to human well-being, and aim to better recognize the interconnectedness of ecosystems across the broad temporal and spatial scales over which ecosystems and humans interact (Daniel et al. 2012). The strength of the ES framework is in its potential to integrate the provisioning (market goods) and non-provisioning (non-market, public goods) ES at the same level of priority (Rodríguez-Ortega et al. 2014), while bringing in also some methodological challenges to determinate and value these services (Chan et al. 2012).

Agriculture deals with ecosystem services and is directly managed to meet human goals, primarily to produce food and fiber. Due to the dominance of economic approaches, agro-ecosystems have traditionally been considered as sources of provisioning services but recently other ES have also been recognised. Provisioning services and regulating services, as well as cultural services and biodiversity conservation, are often viewed as trade-offs with production (Hoffmann et al. 2014; Arovuori & Saastamoinen 2013; Power 2010; Swinton et al. 2007). So far, there is only very limited research examining the native breeds within the broad framework of the ES (Hajjar et

al. 2008; Tancoigne et al. 2014). Yet, some single ecosystem services of native breeds have already been recognised by research, in particular the food products, genetic resources or valuable habitats or landscapes that they provide or maintain (Hoffmann et al. 2014; Rodríguez-Ortega et al. 2014). In addition, native breeds have cultural, social and other values (see e.g. Soini et al. 2012a; Narloch et al. 2011; Gandini and Villa 2003) that could be potentially identified and explored through ES framework and in that way made them more visible in the policies.

In this paper we argue that ES framework is helpful for identifying the various benefits and values that native breeds provide for the environment and human well-being, and therefore the framework has a potential for policy communication and policy making. The objective of this paper is twofold: firstly, to explore the ES framework for recognising ecosystem services obtained from native breeds; secondly, to explore how Finnish stakeholders perceive benefits and values of native breeds within the ES framework. In this way, the ultimate aim is to find out the conditions for operationalising the ES framework as a communication tool in policies concerning native breeds. In this paper we concentrate on the communicative aspect of the ES framework.

2 ES as a potential framework for analysing the values of native breeds

2.1 ES as a concept of biodiversity conservation

The maintenance of live animals in their adaptive environment is important for the conservation of native breeds. The main reasons for favouring live or *in situ* conservation relate to the objectives of conservation: opportunities to meet future market demands, insurance against future changes in production circumstances, present socio-economic value, opportunities for research, cultural and historical reasons and ecological value (Oldenbroek 1999). In addition to these objectives, the development of the breeds can continue with live animals in their adaptive environments. Another type of conservation, cryogenic or *ex situ* conservation refers to storage of frozen material, such as sperm and embryos (Oldenbroek 1999; Henson 1992). Both forms of conservation are needed to safeguard the AnGR but only live conservation can provide other ecosystems services than the option for future breeding.

The different ES classification schemes are founded upon the specific context in which they are being used as well as on the definition used (Fisher & Turner 2008). According to the MA (2005), ecosystem services are classified in four categories: provisioning, cultural, regulating and supporting services. Provisioning services provide material out-

puts, such as animals and crops, seeds or embryos from ecosystems, and they are tangible commodities which can be traded, directly consumed or used in food processing. Cultural ecosystem services are non-material benefits responding to people's cultural and spiritual needs, such as aesthetic and recreational enjoyment. They are based on symbolic, cultural or intellectual significance which many societies place on e.g. culturally significant species (Tengberg et al. 2012). Regulating services are environmental processes or ecosystem functions, such as pest control and pollination. Finally, there are supporting services which are necessary for the production of all other ecosystem services and include photosynthesis, supply of manure and grazing to create or maintain specific habitats for wild plants and animals. Out of these categories, the measurement of cultural services has been considered particularly demanding (Chan et al. 2012; Simpson 2013; Satz et al. 2013).

There is criticism related to the ES approach in general, and to the classification introduced by the MA (2005) in particular. The criticism mainly concerns (see e.g. Schröter et al. 2014) an anthropocentric, instrumental and utilitarian view of ecosystems, which sacrifices biodiversity conservation objectives and focuses on economic valuation. The validity of supporting services of the MA category has been questioned as it amounts to mixing ends (i.e. services they provide) and means (i.e. ecological processes necessary) (Lamarque et al. 2011; Wallace 2007, 2008). Since the introduction of the MA, there have been attempts to improve the classification of ES. The Economics of Ecosystems and Biodiversity (TEEB) replaced the supporting services with a new category of habitat services, whereas the Common International Classification of Ecosystem Services (CICES) introduced a hierarchical classification of ES (Haines-Young & Potschin 2011). Furthermore, Wallace (2007) has argued that one should classify the ES in a way that enables comparisons and evaluations of the consequences of different strategies. That would make the ES a helpful instrument for environmental management. Wallace (2007) and Boyd & Banzhaf (2007) have also pointed out that the identification of ES is dependent on the context as well as on human activities and wants. Others suggest that ES could be classified according to their spatiality: whether they are global or dependent on proximity; what is the location of the ES and the location of people using the service (Haines-Young and Potschin 2011).

The methodological challenges have in particular to do with the incorporation of cultural ecosystem services (CES) into the assessment of ES. They are intangible and therefore difficult to characterise and to measure (Satz et al. 2013). Recent studies have questioned whether the ES concept even provides an appropriate framework for understanding the spatially and temporally changing processes, or the individual and collective valuations that are included in CES (Pröpper & Haupts 2014; Winthrop 2014). However,

while acknowledging this critique, we follow the authors who see that the ES approach is useful when connecting or reconnecting society to ecosystems. It provides a holistic framework to analyse the values across the disciplines and policy sectors. The CICES (2013) framework recognises provisioning, regulating and maintenance and cultural service themes. The supporting services are treated as part of the underlying structures, processes and functions that characterize ecosystems. The final ecosystem services are further divided into five categories: section, division, group, class and class type. The main difference between the TEEB and CICES classification is that the former treats habitat services as a distinct group, whereas in the latter they are identified as a part of regulation and maintenance services (CICES 2013). We use the CICES classification to identify ecosystem services obtained from native breeds, assuming that supporting services as defined by MA (2005) provide value to people only through other services (see Chan et al. 2012).

2.2 ES concept and native breeds

Agriculture is in the core of the discussion regarding both biodiversity and ecosystem services. Agricultural practices create and maintain special ecosystems and habitats but also enable the creation of new varieties and breeds. Hence, agriculture maintains biodiversity but agricultural production methods and management determine whether agriculture enhances or diminishes biological diversity (Soini 2007), in other words, whether it provides ecosystem services or disservices (Arovuori & Saastamoinen 2013). Following the CICES (2013), agriculture supplies provisioning, regulating and maintaining and cultural services but also demands them to be productive (Swinton et al. 2007).

The concept of ES has been used e.g. as a synonym for ecological services, landscape services and environmental services and to refer to input and output services for agriculture. The term ecosystem goods is sometimes used only for those services that have a direct market value, such as food (Lamarque et al. 2011). This derives from the assessment that the most important benefits gained from agro-ecosystems come from the provisioning services, and that all other ES are related to food production (see e.g. Arovuori & Saastamoinen 2013). Regardless of the focus on provisioning services, in most cases both tangible goods and immaterial services provided by ecosystems are recognised as ecosystem services (Lamarque et al. 2011).

The ES framework is widely used to bridge the gap between economics and ecology and therefore these two approaches primarily dominate the discussion (Chan et al. 2012). As yet, native breeds have not been widely discussed in the ES framework. There are analyses concerning the Payment for Ecosystem Services (PES) and other

valuation of non-market products and services provided by native breeds (see e. g. Zander et al. 2013; Hoffmann 2011; Narloch et al. 2011). The concordance between native breeds and ES are also referred to in some of the research concerning sustainable agro-biodiversity management and policies related to it (see e.g. Lescourret et al. 2015; Morgan-Davies et al. 2014; Bernués et al. 2011).

3 Data and methods

The data concerning Finnish stakeholders were collected by interviewing representatives of various organizations and actors engaged in the conservation of native breeds. The stakeholders represented agricultural and environmental administration, education, research and NGOs as well as private entrepreneurs who are engaged in native breeds on different levels of production. The stakeholders were selected to represent different levels and groups of those people and institutions which affect the conservation of native breeds either directly, such as the administration, or indirectly, such as the entrepreneurs who use the products and services provided by native breeds in their businesses.[1] The interviews with altogether nine stakeholders were conducted in the years 2011-2012. The interviews were thematic in character and addressed the following topics: the status of native breeds and the conservation criteria in Finland; governance instruments of the native breeds' conservation; the conservation of native breeds and their organisation; and sustainable use of native breeds and their organisation.

We analysed the interviews with the help of ES concept as a communication tool to explore whether the ES provides a feasible tool to unfold the benefits and values associated with native breeds. The ES concept was not presented to the stakeholders in advance. This decision was made to ensure that the answers reflect the stakeholders' real perceptions, as well as to avoid perceptions being biased towards assumed 'right' answers. The interviews were recorded and transcribed and then translated into English for this paper.

1 The interviewees comprised a representative of the Ministry of Environment, a member of the Finnish National Advisory Board for Genetic Resources; a representative of the Farm Advisory Centres; a representative of the Finnish Animal Breeding Association (FABA), a member of the Finnish National Advisory Board for Genetic Resources; a representative of the Central Union of Agricultural Producers and Forest Owners (Farmers' Union); two representatives of a vocational school for agriculture; a representative of a vocational school for agriculture and a foundation for promoting urban-rural interaction, a member of the Finnish Animal Breeding Association; a representative of the Finnish Landrace Association; and a representative of a cooperative producing meat and milk products of native breeds.

Table 1. Ecosystem Services provided by native breeds according to CICES classification

Section	Division	Group	Class	Class type	Further information
Provisioning	Nutrition	Farm animals for food	Food products	Meat, dairy products, eggs, honey	Tienhaara et al. (2013)
	Materials	Biotic materials	Non-food animal fiber	Wool, fur, skin, feather, down, bones, wax	Arovuori & Saastamoinen (2013)
		Fertilizer	Organic nitrogen fertilizers	Manure, urine	Hoffmann et al. (2014)
		Genetic resources	Genetic diversity; livestock breeds	Sperm, embryos, other genetic material	Oldenbroek (1999)
		Medicinal/biotechnical resources	Animals and organisms for biochemical industrial and pharmaceutical processes	Laboratory animals, test-organisms, biochemical products	Hoffmann et al. (2014)
	Energy	Biomass-based energy	Animal-based material	Manure, methane, ammonium	
		Mechanical energy	Animal-based energy	Draught power	
Regulation and Maintenance	Mediation of waste, toxics and other nuisances	Mediation by farm animals	Waste recycling and conversion of nonhuman edible feed	Recycling of crop residues, household waste, swill and primary vegetation consumption	
	Mediation of flows	Mass flows	Land degradation and erosion prevention	Maintenance of vegetation cover; moderation of extreme events (avalanche)	Morgan-Davies et al. (2014)
		Liquid flows	Regulation of water flows	Natural drainage and drought prevention, influence of vegetation on rainfall, timing and magnitude of runoff and flooding	
		Gaseous/air flows	Storm protection	Maintenance of vegetation cover; moderation of extreme events (fire control)	
			Ventilation and transpiration	Maintenance of vegetation cover (pastures, grazing lands)	
	Maintenance of physical, chemical and biological conditions	Lifecycle maintenance, habitat and gene pool protection	Pollination and seed dispersal	Bees pollinating, seed dispersal by animals, yield and seed quality in crops and natural vegetation	Hoffmann et al. (2014) identifies maintenance of life cycles of species and habitat connectivity (seed dispersal) as habitat services
			Maintaining habitats and gene pools	Pasturing, native breeds as live gene banks maintaining genetic diversity	Hoffmann et al. (2014) identifies maintenance of genetic diversity as habitat service
		Pest and disease control	Pest control	Farming practices, pasturing; destruction of habitats of pest	Oldenbroek (1999)

			Disease control	Genetic diversity between and within breeds; destruction of disease vectors	
		Soil formation and composition	Maintenance of soil structure and fertility	Nutrient cycling on farm and across landscapes, soil formation	Hoffmann et al. (2014) identifies maintenance of soil structure and fertility as supporting service
		Water conditions	Water quality regulation/purification	Water purification/filtering in soils	Hoffmann et al. (2014)
		Atmospheric composition and climate regulation	Climate regulation	Soil carbon sequestration, Greenhouse Gas (GHG) mitigation	
Cultural	Physical and intellectual interactions	Physical and experiential interactions	Charismatic or iconic habitats	Conservation of native breeds, native breeds as pets	Soini et al. (2012b)
			Recreational activities	Rural tourism; Rehabilitation services (Green Care), sports, shows	Soini & Lilja (2014)
		Intellectual and representative interactions	Scientific	Agricultural, sociological, economic etc. research: scientific discovery	Hoffmann et al. (2014)
			Educational	Knowledge systems and educational values; agricultural extension for farmers, environmental education; cognitive development	
			Heritage, cultural	Use in national and regional culture, gastronomy, stories, sense of place	Gandini & Villa (2003)
			Entertainment	Native breeds in media, arts and literature	Partanen (2005)
			Aesthetic	Appearance of the animals; landscapes; inspiration for arts, design and cultural activities	Hoffmann et al. (2014)
	Spiritual, symbolic and other interactions	Spiritual	Symbolic	Native breeds as national or regional symbols, e.g. Finnhorse in WW2	Leinonen (2013)
			Sacred and/or religious	Native breeds in myths concerning ancient religious ceremonies	Yarwood & Evans (2000)
		Other cultural outputs	Existence	Intrinsic value in their own right	Jarvis et al. (2007)
			Bequest	Part of history; gratefulness; intergenerational thinking	Leinonen (2013)

4 Results

4.1 Classification of ES provided by native breeds

In Table 1 we have provisionally divided ecosystem services provided by native breeds in different ES categories. The division is based on earlier research literature concerning the values of native breeds (e.g. Oldenbroek 1999) and ES provided by livestock (e.g. Hoffmann et al. 2014; Arovuori & Saastamoinen 2013). Therefore, it should be noted that many of the services are obtained from other breeds as well. The classification contains both direct and indirect services provided by native breeds.

Similar to other livestock, native breeds provide provisioning services that consist of e.g. food, fiber and energy. The regulating and maintaining services include e.g. disease control in terms of genetic diversity between and within breeds. The cultural services consist of the role of native breeds e.g. in leisure time activities, recognised environments and history. Compared to ES provided by other livestock, we assume that the provision of genetic resources is of special importance when analysing native breeds. Another ES that are likely to be highlighted are the cultural services, in particular cultural heritage. In addition to the impact on environmental challenges, such as erosion due to overgrazing, potential disservices are related to the lower yield of native breeds.

The ES categories are not mutually exclusive: they overlap and often provide simultaneously material and non-material benefits that are hard to separate (e.g. MA 2005; Chan et al. 2012; Satz et al. 2013). Therefore, it is essential to identify the connections between different services. For example, food accounts for provisioning services but simultaneously plays an important role in local gastronomy providing cultural services. The overlapping categories form a challenge to the classification of the ES but reflect the biological, geophysical, social and economic interactions of the real world (MA 2005). In that sense, the ES classifications can contribute to an understanding of how ecological structures and functions are associated with many cultural aspects of human well-being (Chan et al. 2012). Therefore, it is essential to explore the diversity of the services that the ecosystems provide instead of treating all ES as presenting the same services. The inclusion of cultural ecosystem services in environmental assessment is thus important (Satz et al. 2013).

The economic and ecological perspectives have dominated the ES research but have not been able to encompass all dimensions of ES benefits and values (Chan et al. 2012). To make the classification clearer, e.g. Chan et al. (2012) and Satz et al. (2013)

suggest that it is necessary to make the appropriate distinction between *services, benefits* and *values*: three terms that in the ES discussion are often confounded and used in different ways. Following Chan et al. (2012), services are the ecosystem processes underpinning benefits; benefits, as valued goods and experiences, comprise the level on which people can most easily relate to ecosystems; values are the preferences, principles and virtues that we hold as individuals or groups. In other words, service means the production of benefits, and many services produce many benefits, which are of value to people for many kinds of reasons. In this framework, a single service can generate one or more benefits, and each benefit can be associated with different values (Satz et al. 2013; Chan et al. 2012). The benefits are often bundled together, which makes the classification of services challenging. Furthermore, different values do not constitute entities according to which people make their choices. In reality, motivations for conservation are a complex mixture of different value-types (Chan et al. 2012).

4.2 Finnish stakeholders' views on native breeds as part of ES

The stakeholders recognised many of the services classified in Table 1. Some aspects of the provisional division were not discussed at all. This reflects the novelty of the ES classification in questions concerning the native breeds. More importantly, it shows how the stakeholders currently perceive the benefits and values of native breeds. In the following, we will explore the services, benefits and values related to native breeds as identified by the stakeholders. We will also analyze whose benefits and values are in question when discussing different services. The classification follows the typology of Chan et al. (2012) for the distinction between services, benefits and values. Since we use the CICES classification (2013), the supporting services do not form their own category of services.

4.2.1 ES obtained from native breeds

The interviewed stakeholders recognised all three categories of ecosystem services as defined by CICES (2013). They identified provisioning services as the production of material benefits, and regulation and maintenance services as an option for future breeding purposes. The most discussed aspect of native breeds was nevertheless their role in the production of cultural ecosystem services (CES). The emphasis on cultural services is probably a question of trade-offs. The yield of native breeds is lower than that of commercial breeds, and to compensate for this deficiency, it is natural to highlight their sig-

nificance in the production of CES. The stakeholders were active on different levels and sectors of the conservation of native breeds, and thus in favour of their preservation.

4.2.2 Benefits produced by services

The first aspect regarding the benefits of native breeds were the *material benefits* and goods which the breeds provide: milk, meat, wool and skin and other materials, such as semen and embryos for commercial use. The same preference concerns the promotion of local products, which in addition to material benefits had benefits both in terms of *employment* and of *place/heritage* and identity: special products from certain breeds that exist only in certain areas (see also Ovaska & Soini 2011). The following extract shows how the regional breeds could be used to promote local products and rural vitality:

> I would love to see [producers and products of native breeds] all over. They would surely have local markets. It would be nice to have it everywhere in Finland, not only in Helsinki but in the provinces. (Cooperative)

The genetic resources were seen as an important material benefit, because of the special traits they carry. In particular, the genetic resources of Finnsheep were seen as a potential product for export, thus emphasizing the importance of material benefits but above all the *option* for future breeding.

> Speaking of our native breeds, they are very interested in Finnsheep abroad; because it is so fertile, [...] fat free carcass, three different colours, fine wool. It raises interest in different countries, hence we could well export it. (Farm Advisory Centre)

At the time of the interviews, the most topical environmental questions concerning agriculture were those addressing climate change and water-based ecosystems. Consequently, some of the interviewees saw the issue of native breeds being on the background related to these challenges and implied that it is a marginal environmental concern:

> Water management and fighting against climate change are important, genetic resources have more to do with biodiversity, although there is a connection between them and climate protection and water protection. Genetic resources are important when considering climate change and also, I think, water ecology. Genetic resources are a sub-plot concerning landscape and biodiversity. (Farmers' Union)

The breeds maintain biodiversity *per se* in terms of genetic variety, which refers to the very benefit of their *existence*. The stakeholders acknowledged the importance of native breeds and recognised threats to their existence, for example those related to climate change. One interviewee called for "critical and even provoking debate on AnGR similar to GMO" (Ministry of Environment). Another interviewee highlighted the role of human beings in the maintenance of the ecosystem services, as "humans are part of the chain of the ecosystem services" (Farmers' Union). Speaking of agriculture, this is particularly true. However, the interviewee held that the role of the human is often neglected in the Finnish biodiversity policy, although the benefits of native breeds can only be obtained through human-nature interaction (see also Lyytimäki & Petersen 2014).

> Now we have the concept of 'maintenance', an understanding that valuable habitats need people. In Europe, they are aware of this in political decision-making, habitats cannot be maintained without people. Finland comes last, maybe because traditional agricultural environments are lost, if they become indicators, one can understand it. (Farmers' Union)

The visual factor of native breeds as cultural ecosystem services provides an *aesthetic benefit*. There is an aspect of beauty in the animals themselves; in the way they look and in the way they behave (Mace et al. 2012). Aesthetic preferences of ES are subjective (Rodríguez-Ortega et al. 2014). The interviewees reported their personal experiences on these aspects:

> Already in childhood, it attracted my attention how [Finncattle] made contact with people. As a child, I went to see the cows and, of course, the one which came to see me was somehow different. I remember it. And I love the colour. I love brown colour in general and the colour of Western Finncattle is really warm. They are beautiful cows. (Foundation)

The aesthetic benefits are connected to benefits regarding *employment*: rural vitality, businesses engaged in rural tourism or rehabilitation services, and their customers. The therapeutic and educational use of the animals in prisons and school farms were mentioned to be positive for both the residents or students and the breeds, but also for the society as *activities* that the cultural services obtained from native breeds produce.

Many of the interviewees mentioned the *heritage benefit* of native breeds. It is not only about what one's ancestors have made in the past but also about a continuous process of interpreting, valuing and managing the heritage in the contemporary

society by different actors (see also Tengberg et al. 2012). The native Finnish breeds were originally regional breeds, but are now spread across the country. The 'regionality' and 'nationality' of the breeds raised some arguments among the interviewees. As one of the interviewees noticed, Eastern Finncattle is originally a regional breed of eastern Finland "which is first and foremost Eastern: from Karelia, Savolax" (Association). Despite this view, Finnish native breeds are widely regarded as 'national' cultural heritage.

Cultural identity in the context of ES implies the current linkage between humans and their environment. It is an overlapping concept with the heritage benefit to some extent but refers more to the individual's sense of self as related to social and interpersonal links and roles (Tengberg et al. 2012). This was understood by the stakeholders who referred to identity in defining the branch and its actors. "For some sheep farmers, it is a great part of their identity as sheep farmers to rear a native breed, too" (Farm Advisory Center).

Cultural identity was discussed at different levels (northern periphery, national and regional) and it was linked with the traits of the breed arising from the local environment. "Diversity and culture are connected with local adaptiveness which has developed in 1000, 2000, maybe 3000 years. [...] Nevertheless, there can be something: they are special and their meat has a certain taste" (Association).

In addition, *spiritual benefits* related to breeds were mentioned. These benefits were explained as arising from the 'naturalness' of the breeds. Another aspect was that the native breeds could be best conserved as spiritual benefits: "This kind of spirituality could be paralleled with religious enthusiasm supporting the conservation of the breeds" (Association).

Cultural ecosystem services provide a wide range of *inspiration* for art, architecture and folklore (MA 2005). The Finnish artist Miina Äkkijyrkkä is well known of her work related to local breeds (Kissa 2007). The breeds may also be used in cultural events, presenting the way of life in the 17th century, as one of the interviewees described (School). In our interviews, the breeds were seen also as a source of inspiration for an alternative way of life, in particular for youngsters with an urban background. Although there were some doubts related to this kind of a romantic way of life, it was considered an option for some people. It was also noted that this heritage should be passed on to younger generations and to those still to come. In other words, the breeds provide *knowledge* benefits.

4.2.3 Values underlying the services

The *anthropocentric value* of native breeds was emphasised in the interviews, which is natural given that native breeds are components of agriculture, and thus dependent on human-nature interaction. Other values underlying the perceptions and evaluations concerning native breeds varied between different stakeholders. Many interviewees working on the implementation level concentrated on the material benefits provided by native breeds. For these stakeholders, the *values mediated through market* were emphasised. It was a preference to show that native breeds have commercial potential. These stakeholders concentrated on the commercial potential of Finncattle and Finnsheep which are in a hegemonic position among the Finnish landraces compared with other species due to their economic importance.

Regulating and maintaining services often remained as abstract background information to the services and benefits which the interviewees wanted to highlight. Most commonly, regulating and maintaining services, environmental processes and ecosystem functions were mentioned in order to show the interviewed stakeholder's awareness of the issue:

> Of course biodiversity and such are important. That is partly the reason for being here and trying this. The background is there. But speaking of realism: no one pays my bills, if this does not work. (Cooperative)

Some stakeholders saw greater significance in the conservation of native breeds and put more emphasis on the future options provided by native breeds. The representative of an agricultural school pointed out that from the *anthropocentric* point of view, native breeds have *instrumental* value for the uncertain future:

> Working in the agricultural field, we have to admit that we need to take care of them. You never know what happens in this world. Maybe we need the genes one day. If they cease to exist, there is no way to get them back. (School)

Due to the regulative function of native breeds for ecosystems, all the breeds tend to have the same *supporting or instrumental* value. This was pointed out by the representative of the Farm Advisory Centers who highlighted that there is not enough knowledge to state which species/breeds are more important than others.

> [One cannot put genetic resources in order of importance.] Not in my opinion, because we cannot know. Thinking about the changing universe, the globe, climate change and all. I am not wise enough to say what the most beneficial one is in the future, or important to us, the most important. (Farm Advisory Center)

Both *self-oriented* (existence value) and *other-oriented* (bequest value) values are essential in understanding the importance of biodiversity maintenance. It includes intergenerational thinking, which means that native breeds are not kept only for our needs but for the needs of the future generations as well. The gratitude was not only addressed to the landraces but also to the farmers who had kept them, it was again a question of *other-oriented* valuation, although neither the past nor the future generations can express their own perceptions of the *existence / bequest benefit* (see Chan et al. 2012):

> At least I am aware of the value that [the breeds] have lived here with us and developed with people here in the North, they have historical value. We have a responsibility to maintain our ancestors' work and preferences. They brought them here from somewhere long ago and raised the cattle. They were a lifeline to them, we should also uphold them. (Foundation)

According to the interviewees, it is the responsibility of the Finnish people to conserve breeds which are locally adapted, as no one else will. It was not only the breeds, but also the associated local food culture which was considered to be threatened by multinational food industries and various regulations. During the rapid modernisation process of agriculture in the post-war years, the official view towards the low-yielding native breeds was to replace them with other breeds. Nowadays, the role and status of native breeds have been reconsidered, and they receive higher appreciation and have *inherent or final* value. However, this value is not easy to measure:

> The monetary value is quite small at the moment when considering the sales of native breeds. The value in terms of cultural history is much more. Only a few per cent of our cows are native; it is obvious that the amount of milk is not significant. (FABA)

5 Discussion

In this paper, we have explored the ES framework for recognising the ES of native breeds. The framework shows that the ES provided by native breeds are similar to other livestock, but assumably their emphasis is on genetic resources and CES. Hence, we have analysed how the Finnish stakeholders perceive native breeds in the ES framework. We have interviewed stakeholders to find out whether they recognise different ecosystem services, as defined by the CICES (2013), and how they identify the ES as benefits or values, in order to better understand the potential of the ES framework in agro-environmental policy making. Literature has revealed a lot of potential for using ES in policy making concerning native breeds as a communication tool: it helps to represent services, benefits and values obtained from ecological processes in words that are understandable in multidisciplinary scientific and political discourses. Simultaneously, to avoid misrepresentations, there is a need for precise definitions of what ecosystem services are. This is also essential for effective implementation and use of the concept (Lamarque et al. 2011). A clear understanding of the definition and characteristics of ES as well as transparent and appropriate classifications should enable science to inform, rebut, and debate society's understanding of the issue. Conversely it should provide research with information about what is important for the public and decision makers (Fisher et al. 2009).

5.1 How do the stakeholders recognise the native breeds as providers of ES?

The provisioning services are emphasised by both literature and interviews. The provisioning ES consist of tangible products, and are easily regarded as the main ES that native breeds provide. Thus, the ES related to agro-biodiversity have significant use values (Narloch et al. 2011), and the provisioning services constitute the most important way of using native breeds. According to Hoffmann (2011) the reason for emphasising the provisioning services is obvious. They take over the other ecosystem services as governments and businesses usually put the highest emphasis on the economic dimensions of sustainability in their development decisions. The provisioning services provided by native breeds are therefore the most explored in research literature, and the first ES mentioned by stakeholders as displayed in our interviews.

Therefore, it is interesting that the stakeholders extensively highlighted the CES in the interviews (see also Hauck et al. 2013). Overall, CES were discussed by the interviewees more than any other category of ES. The CES are often valued over other ES

in developed societies and their need is estimated to grow in the future, especially in the form of recreation and other leisure time activities (Milcu et al. 2013). The belief in positive impacts on human well-being obtained by native breeds can be recognised in the background. The stakeholders identified CES relating to cultural identity and heritage, CES that e.g. Milcu et al. (2013) refer to as essential for traditional communities. The aesthetic appreciation of live animals and landscapes based on childhood experiences and the needs of citizens of modern societies contribute to the CES recognised by stakeholders.

The role of native breeds as a regulating and maintenance service was brought up, in particular, regarding biodiversity. The relationship between ES and biodiversity is complex, as biodiversity can be seen as a synonym for ES or as an ecosystem service itself (Mace et al. 2012). Also in the research literature the maintenance of biodiversity has been seen as an important aspect of ES provided by native breeds (see e.g. Morgan-Davies et al. 2014). It is clearly a question of benefits gained from native breeds in terms of maintenance of genetic diversity and option for future breeding. However, the regulating and maintaining services stayed in the background in the interviews.

5.2 How do the stakeholders see benefits and values?

In the context of CES, the stakeholders were at their strongest when showing the values they hold concerning native breeds. This is not surprising as in some ES classifications CES are defined as values (Chan et al. 2012). All stakeholders identified the cultural and historical benefits of native breeds, but differed in their opinions of how these should influence the current policies concerning native breeds: whether the native breeds should be utilised in new forms of rural entrepreneurship or conserved as a non-market mediated relic from the past; whether the cultural and historical benefits were background to be respected or the main reason for conservation.

Temporal and spatial aspects were brought up several times by the stakeholders. Intergenerational thinking, gratefulness towards the history of the breeds and the work and life of previous generations, and educational benefits to younger generations were considered important. The spatial aspects comprised both local and global dimensions. Native breeds are important in local culture and history but the genetic resources provided by them are of global importance. However, in the interviews only provisional and cultural benefits were placed in time and space. Therefore, taking care of biodiversity as a regulation and maintenance service was seen as a responsibility of the government whereas the sustainable use of live animals, and the provisioning

and cultural services and benefits obtained from them, was regarded as a business or other opportunity at the implementation level. The ES are dependent on the context in which they are produced, and therefore the role of implementation level is essential in understanding the real processes of obtaining benefits from ES (Hauck et al. 2013).

Appropriate agricultural management practices are critical to realising the benefits of ecosystem services and reducing disservices from agricultural activities (Power 2010). Trade-offs occur when the provision of one ES is reduced as a consequence of increased use of another ES (Rodriguez 2006). There are trade-offs between provisioning services on the one hand, and regulating, supporting and most cultural services on the other (Hoffmann et al. 2014). Because of the lower yield of native breeds, the stakeholders emphasised the role of native breeds as providers of cultural benefits. In the context of agriculture, provisioning services are usually regarded as the most important provider of benefits. However, in the case of native breeds, the stakeholders felt it important to underline other benefits in addition to speaking of specialty products and other forms of rural entrepreneurship favouring the use of native breeds.

6 Conclusions

The ES concept provides a framework to identify the values of native breeds by recognising not only provisioning but also other ecosystem services connected with culture, identity and nature (Rodríguez-Ortega et al. 2014). According to our research, in addition to the provisioning services, the CES were identified by the stakeholders in different ways. Hauck et al. (2013) have received similar results in their research concerning ES policies perceived by stakeholders. This strengthens the perception of ES as a feasible approach in the case of farm animals which are cultural animals and whose maintenance is dependent on human activities. There are also challenges regarding the definition of the ES concept, which should be developed further, and regarding the several classifications of the ES framework, which should not be mutually exclusive and thus oversimplify the ES at the higher level (Fisher et al. 2009; Hauck et al. 2013). Lyytimäki and Petersen (2014) suggest that ES concept should be seen as a set of different heuristics to identify and evaluate the role of ecosystems in human societies. In this sense, the ES can be used as communication tool for policies instead of a mere monetary valuation of benefits obtained from nature.

Regarding the conservation of native breeds, there are particular challenges that can be overcome with the help of ES concept. The marginality of native breeds' conservation compared with other environmental issues was clearly shown in the inter-

views. We argue that the recognition of native breeds as providers of ES helps to make them more visible in the politics and promotes their sustainable use and conservation. The decision-making processes themselves do not rely purely on scientific information. Therefore, the stakeholder interviews revealed what issues and perspectives are regarded important in the short term, and what information is actually utilised by decision makers (see also Fisher et al. 2009).

Hoffmann (2011) has noted that the extinction of AnGR continues at an accelerating rate unless better ways to maximise co-benefits between biodiversity conservation and economic development are found. The native breeds bring lower private market returns to farmers but generate non-marketed ecological and cultural public good benefits (Midler et al. 2015), and therefore it is essential that the values of native breeds are recognised among relevant stakeholders, farmers and the wider public. According to Lescourret et al. (2015) the sustainability of agro-ecosystems depends on their ability to deliver an entire package of multiple ecosystem services, rather than provisioning services alone. The same applies to native breeds and their conservation, and new social and ecological dimensions of agriculture need to be explored to foster this ability (see Lescourret et al. 2015). In our research, the stakeholders recognise native breeds as providers of ES, even to a wider extent than the research literature at the time of the interviews did.

We argue that the ES approach, which integrates both ecological and cultural aspects of conservation, can be seen as a great opportunity for conservation and sustainable use of native breeds, as they are, on the one hand, results of the co-evolution of human and nature and, on the other hand, dependent on cultural values and practices. Although it is nowadays widely understood that biodiversity has intrinsic value and should be conserved for its own sake (see Jarvis et al. 2007), the ES and human well-being are likely to become more important arguments for the need to preserve the natural capital, as Haines-Young and Potschin (2009) have argued. More research is thus needed on the linkages between different categories and the trade-offs.

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Local Breeds – Rural Heritage or New Market Opportunities? Colliding Views on the Conservation and Sustainable Use of Landraces

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Abstract

In this research, Finnish actors engaged in the conservation and sustainable use of local breeds on different levels and sectors were interviewed to find out how breeds are valued by different stakeholders and what kinds of policies and practices are preferred in their conservation and sustainable use; and which also gives rise to some ethical concerns. Four storylines based on sustainable use vs. conservation and service-based vs. production-based dimensions were derived from the research data. The research revealed a broad diversity of perceptions of the aims and means of conservation and sustainable use. Some stakeholders brought up different possibilities regarding the different means of *in situ* conservation. Yet, many were strictly in favour of conservation and against sustainable use. Moreover, in questions of ownership, stakeholders differed in their opinions. The colliding views diversify the conservation and sustainable use of landraces but simultaneously constitute a challenge to finding common aims and means to it. Communication between stakeholders should be improved to enable actors, at the implementation level, to make long lasting commitments regarding the conservation and sustainable use of local breeds. Furthermore, animals should be regarded as conservation actors, in addition to people and organisations.

Introduction

Intensification of agriculture with internationally marketed livestock has led to remarkable changes in the number of local breeds. The situation is especially critical in Europe, where up to 40 per cent of the breeds are endangered (FAO 2010). However, local breeds are still the basis of selection for efficient food production in the changing environment (FAO 2007, 2010). Local breeds produce ecosystem services (ES),[1] most notably provisioning services, such as food, fibre and genes, but also

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cultural services, such as maintenance of cultural heritage or identity and regulating services such as landscape and biodiversity management. New forms of rural entrepreneurship that utilise local breeds, e.g., tourism and Green Care, are developing and expanding in rural areas (Hassink and van Dijk 2005; MA 2005; European Commission 2008; Soini and Lilja 2014; Ovaska and Soini 2016). Rural livelihoods that promote environmental goals and provide ES can become important sources of income and vitalise rural areas. The utilisation of local breeds in businesses engaged in, e.g., the processing of foodstuffs, handicraft, tourism or recreational and social services contribute to the diversification of the rural economy (see also European Commission 2008).

Arguments for conserving low-yielding local breeds are widely recognised by the scientific community, public administration, farmers and public (Mendelssohn 2003). Therefore, the main question is not whether the breeds should be conserved, but who should conserve them and how. In practice, the question revolves around whether the conservation should be organised on public, for-profit private or non-profit private farms (see also Hodge and Adams 2014) and what are the conditions for the different types of conservation and partnership building. Agrobiodiversity conservation is increasingly turning towards market-oriented conservation governance, where farmers are seen as producers of ES taking advantage of emerging market opportunities. Thus, neoliberal thinking is transforming the conservation of agrobiodiversity for the delivery of ES (Roth and Dressler 2012; Hodge and Adams 2014; Ovaska and Granholm 2014). From the standpoint of local breeds, this process presents new risks and challenges to the maintenance of public interest, especially in economically challenging times, as the private sector cannot be obliged to maintain local breeds, at any cost. The process also provides conservation with new opportunities (Hodge and Adams 2014), especially in terms of commodification of local breeds, to promote rural development and livelihoods.

There is a need for sustainable and feasible policies to conserve and utilise the existing wide diversity of local breeds in rural development. Developing and implementing successful conservation policies and the sustainable use of local breeds in rural livelihoods, requires knowledge on how they are valued by different stakeholders and what kinds of policies and practices are preferred for their conservation. Agrobiodiversity issues concern different policy domains and various interest groups, such as farmers, rural entrepreneurs and citizens. It can be assumed that stakeholders differ in the perceived values and most favourable means for their conservation and use. The relationships between actors, at and across different scales, need to be analysed to understand different conservation strategies and their consequences (see also Stock et al. 2014). Furthermore, the ethical questions concerning the human-animal relationship need to be taken into account in developing the conservation and sustainable use of animals (see also Haraway 2008; Holloway et al. 2009).

Previous research has explored the motivations and values of farmers for keeping local breeds, and those of citizens and consumers for paying for the maintenance of local breeds and their products. In purely economic terms, farmers are motivated to keep low-yielding local breeds, if they receive full compensation for their lost income, either from the state or as products or services. Yet, in the former case, agro-

environmental support has not been sufficient to compensate for the lower yield of the breeds (Karja and Lilja 2007; Tilzey and Potter 2008), and in many agro-environmental schemes, livestock even remain neglected (Evans and Yarwood 1995; Evans and Yarwood 2008). Hence, the reasons, for keeping local breeds, go beyond their role in primary agricultural production. These reasons include social and cultural values that the breeds represent, as well as their contribution to biodiversity (Evans and Yarwood 2000; Yarwood and Evans 2000; Karja and Lilja 2007; Ovaska and Soini 2011; López Moreno 2014; Martin-Collado et al. 2014). Conservation of local breeds is widely accepted among the general public, but preferences, as to means of conservation, vary strongly (Pouta et al. 2014; Tienhaara et al. 2015). The sustainable use of local breeds, in specialty products and other forms of rural entrepreneurship, is not a new phenomenon, and it has developed strongly during the 2000s (e.g., Garrod et al. 2006; Jackson et al. 2006). However, more information is needed on realistic options of *how* and *by whom* conservation should be organised, and what the conditions are for different types of conservation and partnership building.

In this article, we explore the governance structures and agencies of conservation of local breeds to evaluate the potential of local breeds enhancing and developing rural livelihoods. We will explore: (1) How do stakeholders perceive different types of conservation and the associated ownership and partnerships requirements?, (2) What are the aims and values affecting the governance of conservation? and (3) How could the full potential of local breeds be brought into use for the benefits of the rural enterprise? We will answer these questions using the conservation of local breeds, in Finland, as a case study.

In the following, we will first discuss the governance of local breed conservation in a broader agro-environmental context, and then introduce the main actors and governance structures of the conservation policy, in Finland. After that, we will introduce our research data and material. The stakeholders' perceptions of local breeds, in the context of rural livelihoods, are analysed and discussed in respect to various conservation aims and means. Finally, we will discuss the resulting implications for bundling commodification benefits of local breeds with the enhancement of rural development and livelihoods.

Research setting

Governance of the conservation of local breeds

The conservation of local breeds is part of a broader discussion on the conservation of agrobiodiversity and safeguarding the services provided by ecosystems. Bundling ES and biodiversity conservation has become a common conservation strategy, due to the potential concordance between these two objectives (Turner et al. 2007). The focus on ES reflects the current market-oriented governance of biodiversity conservation, which has brought about significant changes in the ways in which nature is governed and conserved. Biodiversity conservation is seen as services and functions, and alternative forms of ownership and partnership are emerging. As a result, e.g., ES

have become an increasingly important element in environmental policy, and of framing environmental management (Hodge and Adams 2012, 2014).

Different ES are obtained from local breeds (Chan et al. 2012; Satz et al. 2013; Ovaska and Soini 2016). Provisioning services consist of, e.g., food, fibre, genes and manure. Regulating services include, e.g., nutrient cycling and genetic diversity between and within breeds, as well as disease control. Cultural services (CES) consist of, e.g., the maintenance of heritage and identity, such as local gastronomy and cultural landscapes, as well as of rural services, such as agrotourism and rehabilitation. In addition, supporting services consist of ecological processes that form the basis of other services (Ovaska and Soini 2016). Regarding the promotion of rural livelihoods and conservation of landraces, the provisioning, regulating and cultural services, in particular, have the potential to enhance these two aims.

The concept of ES provides a tool for exploring the benefits and values of local breeds and discussing them in decision-making (Ovaska and Soini 2016), although the ES approach has been criticised for its anthropocentric, instrumental and utilitarian view of ecosystems (see, e.g., Schröter et al. 2014). Agriculture both provides and consumes ES, and is essentially managed to meet human goals, primarily for production of food and fibre. Therefore, the benefits obtained from ES, provided by local breeds, can only be obtained through human-nature interaction (see also Lyytimäki and Petersen 2014).

The market oriented approach in biodiversity conservation has been criticised for ignoring factors other than economic rationality in decision-making processes. In the real world, people take into account diverse cultural values, social obligations and interactions, where the monetary value cannot be evaluated (Büscher et al. 2012). Another criticism concerns public interest that can be threatened when conservation is in private hands. (Kosoy and Corbera 2010; Büscher et al. 2012; Hodge and Adams 2014). According to Hodge and Adams (2014), one way of considering the governance of conservation is to analyse what type of ownership is most likely to lead to an outcome that reflects wider public interests. These alternatives include: (1) state ownership that is either directly managed or includes outsourced activities, (2) private for-profit ownership, freeholds or leasehold, subject to regulations with potential for contracting the provision of public goods and (3) non-profit ownership, freehold or leasehold, subject to regulations with potential for contracting for the provision of public goods. These three alternatives are not mutually exclusive and exist in parallel; however, the balance between them is essential and requires partnerships.

The commodification of local breeds raises a further question of how the animals are commercialised. That is, which characteristics of the landraces are selected and regarded as necessary for commercial purposes and by whom the selection process is to be carried out. Holloway et al. (2009) refer to the concept of biopower in relation to the way livestock are regulated and fostered by power-knowledge relationships, in particular, by genetic techniques. Biopower contains the idea of biopolitics treating animals as *populations*, whose births, deaths, reproduction and illnesses are managed by human interventions. Biosocial collectivities, such as breed societies, are constituted around these interventions. According to this view, local breeds comprise a population that is constructed to transform the bodies and experiences of these animals, by human interventions. As Haraway (2008) notes, livestock breeding is a series of

moments and spaces in which species meet, and the power relations between humans and animals are far from being equal (see also Holloway et al. 2009; Sellick and Yarwood 2013).

In the case of local breeds, the conservation techniques are generally divided into two main types: *in situ*, i.e., the conservation of living animals and *ex situ*, i.e., the cryoconservation of genetic material, including animal semen and embryos. *Ex situ* conservation can technically be organised in gene banks, where frozen sperm and embryos are kept. Nevertheless, if the breeds only exist in gene banks, they cannot be securely conserved because frozen material is unable to adjust to changing conditions and there is no natural variation in the breeds. Therefore, it is also important to maintain living animals. This so called *in situ* conservation is widely preferred by researchers and conservation organisations (Oldenbroek 1999; Tempelman and Cardellino 2007).

In situ conservation is not only a technical issue, but also a political one in order to be properly arranged. In developing countries, local breeds often play an important role in agricultural primary production and livelihood systems. In these countries, the main challenge is to find means for preserving local breeds in the changing livelihood systems (Granberg et al. 2009; Hoffmann 2011; Narloch et al. 2011; Soini et al. 2012a). The role of local breeds in developed societies is more related to multifunctional agriculture (Signorello and Pappalardo 2003). Multifunctional agriculture has been supported through promotion of sustainable agriculture and farm diversification (Robinson 2008). Farm diversification includes the deepening (on-farm sales and processing) and broadening (agrotourism, Green Care, nature conservation) of farm activities (Meraner et al. 2015). In both contexts, the cultural services (role in history, region) provided by local breeds and their genetic features (small size, thick fur), compared to other breeds are important (Ovaska and Soini 2016) and become a resource for commodification.

There are already examples of the commodification of local breeds in different countries. In the UK, the Rare Breeds Survival Trust has established farm parks for landscaping as well as for new forms of entrepreneurship, attracting visitors from agritourists to filmmakers. The rare breed meat has also been labelled as a high quality food (Evans and Yarwood 2000). In Finland, the Eastern Finncattle has become a known label and their meat and dairy products are sold in high-end restaurants, across the country (Karja and Lilja 2007). In Spain, cheese products obtained from local sheep breeds have become high quality food (López Moreno 2014). Thus, the breeds can be used in services, specialised products and other rural enterprises, for the benefits of rural development. In some cases, the commodification of the rural commodities has even safeguarded local breeds that were neglected by agro-environmental schemes (Evans and Yarwood 2008).

Successful commodification may also lead to undesired situations. The idea of local breed conservation is invalidated, if the status of rare breeds is extended too far. This may happen if unusual, but not rare breeds, such as Highland Cattle, are included in the same niche market with local breeds, as has happened, e.g., in farm parks (Evans and Yarwood 2000). The role of animal breeding is another problem that may lead to breeds losing their status as landraces. A major ethical question is whether one is allowed to breed landraces to improve their yield (Karja and Lilja

Table 1: *Number of cows of different Finncattle breeds in 1997, 2007 and 2012.*

Year	Eastern Finncattle	Western Finncattle	Northern Finncattle	Total
1997	307	1811	237	2355
2007	438	1301	508	2247
2012	879	805	596	2280

Source: TIKE (2012).

2007). Conservation tends to focus on the animals, not on the way of life of the farmers keeping them (Evans and Yarwood 2000; Ovaska and Soini 2011). Some of the farmers who keep local breeds are interested in bulk-production, not in developing special products or services (Soini et al. 2012b), nor are they willing to sell their products outside of the local area (López Moreno 2014), which can form an obstacle to the commodification and creation of niche markets for the products. There is also a risk that a market oriented approach will only make agrobiodiversity conservation tempting to small or medium-sized farms that are unable to respond to enlargement and intensification demands, which then puts them at risk of demise (Tilzey and Potter 2008).

Conservation of local breeds in Finland

The local farm animal breeds that exist in Finland are Finncattle, Finnsheep, Finngoats, Finnhorses, Finnchickens and roosters. There are also local bees and dogs. In Finland, the population trends of local breeds have followed the ones of the Western world. Since the modernisation of agriculture, starting in the 1950s, local breeds began to decrease in number (Evans and Yarwood 2000; Karja and Lilja 2007; Soini and de Haas 2010). Eastern Finncattle and Northern Finncattle, Kainuu Grey sheep and Åland sheep are endangered, according to the FAO classification (FAO 2007), and the Finnish Landrace pig is extinct. With the help of the agro-environmental support scheme (since 1995), other policy measures and increased awareness, no more breeds have become extinct. Some of the populations have even become more numerous (Table 1). The keepers of local breeds can make environmental agreements with the government. The support is 530 euros/animal unit/year for cattle and 300 euros/animal unit/year for sheep, goats, horses, chicken and roosters (MAVI 2016). Farmers, themselves, consider the support important for keeping local breeds (Lilja 2011).

There are a number of actors involved in the conservation of the breeds. The genetic resources of agriculture belong to the authority of the Finnish Ministry of Agriculture and Forestry, whereas other biodiversity conservation is the responsibility of the Finnish Ministry of the Environment. Since Finland became a member of the EU, conservation of local breeds has been part of the agro-environmental policy. As a result of the Common Agricultural Policy (CAP) and Rural Development Programme (RDP), environmental issues are integrated into agricultural policies, and co-

operation between agricultural and environmental actors has increased at all levels of governance. The farmers are paid agro-environmental support for maintaining the breeds and associated biotopes. As Stock et al. (2014) have noted, these schemes divide and price the environment into transactional components, although they do not fully represent free market exchange.

As both the agricultural and the environmental sector participate in the decision-making of agro-environmental policy, economic and environmental interests easily compete, although the cooperation between the policy sectors and levels has increased during the past few years (Kröger 2009; Kaljonen 2011). Both sectors participate in the work of the Council of Genetic Resources, under the Ministry of Agriculture and Forestry. The Council supervises and follows the activities and progresses of the Finnish National Animal Genetic Resources Programme in a similar manner to programmes related to plant, horticultural and forest genetic resources. The Finnish Rural Policy Committee[2] has set its goal at ensuring that rural livelihoods safeguard biodiversity and using ES in a sustainable way, by the year 2020. To achieve this, emphasis will be on ES when developing economic and production structures in rural areas. Furthermore, new innovations concerning the sustainable use of ES provided by, e.g. rural environments are supported by directing research and introducing its results into practice (Rural Policy Committee 2015).

Agro-environmental support for genetic resources is co-ordinated by the *Centres for Economic Development, Transport and the Environment* (ELY Centres), where both sectors are presented. *Farm Advisory Centres* act closest to the farmers concerning the breeds, and their associated livelihoods and traditional biotopes. For animal breeding, there is the *Finnish Animal Breeding Association* (FABA), a special organisation, which handles farm animal breeding and its organisation, as well as maintains a farm animal registry, that includes local breeds. Besides farmers, *vocational schools and prisons* are important *in situ* gene banks for the maintenance of local breeds. Vocational schools and prisons also have the possibility to act as *in situ* gene banks, by keeping lower-yielding breeds, as their financial resources are not dependent on agricultural production. Moreover, the schools train new farmers and introduce them to different production methods, including the keeping of local breeds. The *Finnish Landrace Association*, for its part, is an independent, volunteer-based association for people interested in local breeds and plants. The association brings together farmers and city-dwellers interested in these breeds and plants and their associated habitat; however, it does not have any financial resources for keeping the animals. In addition to *farmers* maintaining local breeds, there are other *entrepreneurs* and *associations/foundations*, which either process meat and milk products or practice tourism, educational services or use the animals for landscape management. The *Central Union of Agricultural Producers and Forest Owners* represents the farmers and their interests at different levels and forums, e.g. in negotiations with the administration, politicians or commercial actors.

Data and methods

The main research data were collected by interviewing representatives of various organisations and actors engaged in the conservation of local breeds. The

stakeholders represented agricultural and environmental administration, education, research and non-governmental organisations (NGOs), as well as private entrepreneurs who are involved with local farm animals on different levels of production. The stakeholders were selected to represent different levels and groups of people and institutions, which affect the conservation of local breeds either directly, such as in administration, or indirectly, such as with entrepreneurs who use products and services provided by local breeds in their businesses. The interviews were conducted during 2011–2012.

The interviewees were comprised of: (1) a representative of the Ministry of Environment, a member of the Finnish National Advisory Board for Genetic Resources, (2) a representative of the Farm Advisory Centres, (3) a representative of the Finnish Animal Breeding Association (FABA), a member of the Finnish National Advisory Board for Genetic Resources, (4) a representative of the Central Union of Agricultural Producers and Forest Owners (Farmers' Union), (5 and 6) two representatives of a vocational school for agriculture, (7) a representative of a vocational school for agriculture and a foundation for promoting urban-rural interaction, a member of the Finnish Animal Breeding Association, (8) a representative of the Finnish Landrace Association and (9) a representative of a co-operative producing meat and milk products from local breeds.

The interviews were open by character and addressed the following topics: status of local breeds and conservation criteria in Finland, governance instruments of local breed conservation, conservation of local breeds and their organisation; and sustainable use of local breeds and their organisation. The interviews were recorded and transcribed and then translated into English for this article.

All of the interviews were analysed with the help of discourse analysis, which is a useful tool for identifying the construction of a particular problem, how the problem is framed, and how the solutions are envisioned in society, policy, and practice. Discourses frame certain problems: they distinguish some aspects of a situation over others (Hajer 1993). We interpreted the stakeholders' views on local breeds, within the framework of ES (MA 2005), as a discourse. As such, a discourse provides the tools with which problems are constructed and at the same time forms the context in which phenomena are understood and thus predetermines the definition of the problem (Hajer 1993).

Furthermore, we used the concept of storyline. According to Hajer (1993), a storyline is a generative sort of narrative in which certain various discursive categories, ideas or concepts are used to give meaning to specific physical or social phenomena. Storylines structure and re-order meanings of discourse. In a way, they are semiotic tools, making the discourse more understandable (Hajer 2005). Storylines are formed within a discourse. They are not based on facts alone, but on narratives. In our case, this is on the perception of what the aim of conservation is and how, and by whom, it should be carried out. These perceptions form storylines. A storyline is, therefore, a mechanism for creating and maintaining meaning, and it speaks to particular ways of constructing a problem. Different stakeholders may contribute to more than one storyline, which are discussed with reference to the values, political ideologies and institutions the stakeholders represent and advocate. In our analysis, the storylines were derived by inductive reasoning. They were identified from the

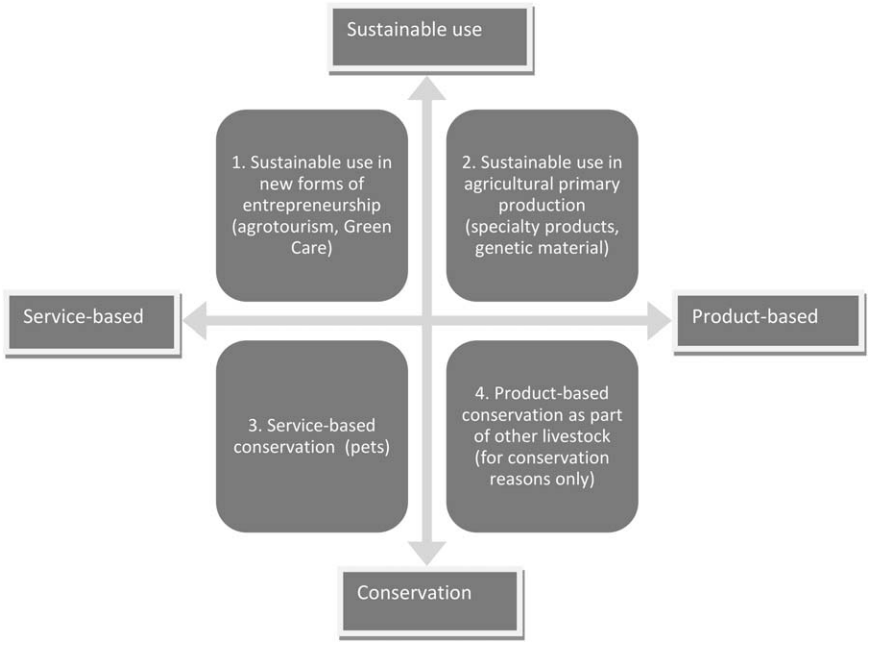

Figure 1: *Four storylines of the local breed conservation in situ*

interview data through repeated in depth-reading, examination and comparison. Some of the interviewees had different roles and positions, and also gave their personal views or experiences of the breeds. There were some colliding perceptions between actors, which in some cases, led to very strong, provoking opinions.

Results

Four storylines of landraces in rural development

Four different storylines that formed the discourse on conservation and sustainable use of the local breeds *in situ* (Figure 1) were identified. The main dimensions of the storylines first concern the use of the breeds. A distinction can be made between service-based (or multiple use of the breeds) and product-based (milk, meat and wool) use of local breeds. *Service-based* use widely refers to all ES the breeds produce for human wellbeing. Instead, *product-based* use takes a narrower approach to ES, emphasising the role of provisioning services. The other dimension (*sustainable use – conservation*) describes whether the animals should be actively used or exploited in economic activities or just kept as a reserve for the future. The sustainable use of animal genetic resources (AnGR) already comprises an important part of the biodiversity

conservation in the Rio Convention (CBD 1992), which linked 'traditional' conservation efforts to the goal of using resources sustainably. The EU currently promotes a consequent change of policy orientation to move beyond conservation to active, sustainable use (European Commission 2013).

Service-based sustainable use includes the role of landraces in new forms of rural entrepreneurship, such as tourism and Green Care (see, e.g., Hassink and van Dijk 2005), as well as in landscape management and maintenance of cultural heritage. Product-based sustainable use consists of the tangible products that local breeds provide, including special products made out of their milk, meat, wool and skin as well as that of their genes that can be used in animal breeding. Service-based conservation focuses on the role of breeds as pet or hobby animals. Product-based conservation stresses the maintenance of biodiversity.

Sustainable use in new forms of entrepreneurship. The first storyline highlighted the importance of sustainable use as the best conservation strategy for local breeds. Here, the new forms of entrepreneurship and rural services were seen as the best solution for the sustainable use, including tourism, landscape, recreation, and rehabilitation. The multiple values of the breeds were recognised and, in particular, cultural ecosystem services (CES) were frequently mentioned. Local breeds represented human-nature interaction and co-operation between nature and people. This perception highlighted the naturalness of local breeds and the needs of people, in modern societies, to spend leisure time in nature. In modern societies, urbanisation is strong and people come to relax in nature. This enables business opportunities in agrotourism and rehabilitation services that are not dependent on yield, but rather on other benefits obtained from local breeds.

> 'There are biotopes in agriculture; it could provide people with immaterial well-being, show that man is part of nature. People are happier when they can spend time in nature. Rural tourism is one thing which could benefit from this... It is an environmental service; do not focus on kilos or litres'. (Farmers' Union)

In our data, the stakeholders considered the local breeds to be important aspects of landscape. However, Evans and Yarwood (1995) have noted that, for most people livestock are important elements of the landscape, regardless of breed. On the other hand, breeds with strong local identities are often clustered in particular localities (see also Sellick and Yarwood 2013).

Some of the interviewed stakeholders regarded the service-based sustainable use as a means to publicise local breeds, not as the optimal way of conservation, *per se*. Raising the profile of all local breeds would help customers to understand their value. In this sense, commodification of local breeds would benefit all actors involved in the conservation and all livelihoods connected to local breeds. The visual factor is important: live animals need to be used in advertising the products and services, which puts emphasis on the service-based sustainable use, of local breeds.

> 'If we raised their profile, our customers would also understand their value. It can be products, landscaping... or... grazing, anything to get the customers to understand. That way, we could add more Euro to the sheep chain. Then, we could have them also in the future'. (Farm Advisory Centre)

For the most part, service-based sustainable use was emphasised by those stakeholders that preferred private for-profit ownership. Service-based sustainable use was also criticised for not respecting the original use of local breeds: they are production animals and, therefore, using them in services, such as grazing, is not appropriate. The critics of market oriented approaches have also noted the contradictions related to, e.g., ecotourism that provides local and national conservation solutions, without considering its consumptive contribution to environmental problems, on various scales (Büscher et al. 2012).

Sustainable use in agricultural primary production. The second storyline favoured product-based sustainable use of breeds, but primarily within agricultural primary production, that is, in the same purpose as the local farm animal breeds were originally selected for. However, compared with the past, producers were more aware of the special traits and breed origin, highlighting this in marketing. Economic profitability was achieved through the added values of the products (health, gastronomy products, local food) and by increasing volume through breeding.

> 'Previously, we simply sold lamb and mutton, now the producers highlight that this is the meat or skin of Finnsheep. Not sheep but Finnsheep'. (Farm Advisory Centre)

The use of local breed products is also in line with current food trends, the preference for local food. However, one of the interviewees, who had managed to commercialise the products, denied any accusations of only being interested in landraces for trend reasons, asserting that they instead should be seen as 'ever green' products, local and natural.

> 'In a way, it is an unused natural resource. It does not matter if local food is trendy or not. That is not the issue. It is simply the fact that since we live in a place like this, we make food out of these'. (Co-operative)

The genetic material of local breeds was also considered a product for exports, because of the special traits and their role in, e.g., disease control.

As production use was emphasised, this storyline was most positive for breeding to increase animal productivity and the volume of production to make production more economically sustainable. For example, the average yield of Finncattle was 6,109 kg of milk, in 2012, with a fat content of 4.4 per cent and a protein content of 3.46 per cent. The average yield of the most common dairy breed in Finland, Ayrshire, was 8,571 kg of milk, with a fat content of 4.28 per cent and a protein content of 3.44 per cent (FABA 2014).

> 'In my opinion, it is important to breed them, too, for the purpose that they originally were here, to give us meat and milk. [...] One cannot really compete with the commercialised breeds, they are bred to give the maximum yield but these could have other values: milk content is good and should be studied more, I think'. (Foundation)

Another expert was ready to concentrate on dairy production and admitted that Finncattle are not productive enough for meat production. They should be kept in milk production, for economic reasons. Regarding the on-farm reality, farmers usually keep animals in production, and from the point of view of product-based

sustainable use, it should be taken as a premise. 'We assume that this breed is in milk production, their meat yield is not at the level of a meat breed. I see them as dairy cattle'. (FABA)

Despite differences in whether some of the traditional production lines of local breeds should be abandoned, this storyline strongly favours the use of the breeds as production animals. For some, even the use of local breeds as suckler cows was too much and regarded as the first step to other usages, such as landscape management, therapy and pet use, which were not approved of at all in this storyline: 'Cows in the park! [. . .] I have tried to sell them to milk production so far. [. . .] I will not sell them to be used as suckler cows'. (Foundation) As Burton (2004) has noted, the self-identity of farmers as food producers can be so strong that they resist change on the basis of an anticipated loss of identity or sociocultural rewards.

For some stakeholders, the service-based use and product-based use were equivalent options. The representative of the Farmer's Union emphasised the economic viability and professionalism of the maintenance of local breeds. The multiple benefits of local breeds for ecosystem and human well-being were recognised, but only as long as the activities were economically viable, either through markets or subsidies. The Farmers' Union actively promotes new rural livelihoods, but at the same time, advocates landowners' and farmers' rights. For these reasons, it is understandable that the Union tries to defend the farmers' and rural entrepreneurs' position, in the conservation of local breeds. Farmers often oppose conservationists, if production is threatened, but are willing to accept their view, if suitable compensation is paid (Evans and Yarwood 2000).

Service-based conservation. The third storyline recognised the multiple values of the breeds – from ecological to cultural. It was in favour of conserving the local variations, on a small scale, for non-commercial use. If the breeds were kept in primary production or commercialised, there would be pressure to breed them and their special traits might be lost. Consequently, this storyline suggests that the breeds should only be used as pets in non-economic situations, such as a hobby or with subsidised use. As Holloway (2001) has noted, animals on hobby farms acquire a status somewhere between farm livestock and pets, although one usually distinguishes between these two categories.

> '[T]he conservation of landraces could become more voluntary-based. [. . .] People could keep the prices high on their own expense. One buys pedigree dogs, unbelievably expensive hounds, and cats and such, too'. (Association)

Some stakeholders accepted this storyline as one option of *in situ* conservation. Extending the use from milk to meat production was considered a condition for the economically productive use of the breeds and, thus, a condition for sustainable conservation in the long run: 'They can graze, be pets, but most of them have to be in production to guarantee the maintenance of the breed'. (Co-operative)

On the other hand, service-based conservation was most strongly opposed by the supporters of other storylines. The opponents argued against it, for historical reasons, as the breeds have been the 'lifeline' of the Finnish population and 'are not really cats' that can be treated as pets. Neither did the opponents see them as relics from the past:

> 'The use of genetic resources is also the best conservation. It is better to have an Eastern Finncattle cow as a product on the market than in a museum. The conservation is more successful if they can be commercialised and it is profitable at least to some extent'. (Ministry of the Environment)

The Association for Landraces was most connected to conservation that favoured non-profit ownership: local distinctiveness of the breeds through small-scale hobby-based use and through civil society. They were rather sceptical of market-based conservation and of how pure the lower-yielding landraces would stay. As Büscher et al. (2012) have noted, all conservationists are not fond of neoliberal solutions. The conservationists of cultural heritage are often in conflict with other conservation groups (Evans and Yarwood 2000). The perception of the service-based conservationists was strongly opposed by educational institutions and the foundation that favoured productive use of the animal, which they considered 'original'. This not only reflects the educational objectives of these institutions, but also their new roles as public institutions: they have commercial activities connected to education, such as on-farm sales or organising events. The product-based use was also highlighted by stakeholders who preserve the genetic material in their institutions. The representative from the Ministry of the Environment thought that either service-based or product-based use would lay a solid base for conservation, in the future. This is a somewhat different view from the other conservation policy by the Ministry of the Environment, related to livelihoods. The ES are recognised as a potential source of income for rural livelihoods in the policy programmes intended for developing the rural areas (RDP 2014).

Product-based conservation as part of other livestock. The fourth storyline emphasised the use of local breeds in primary production but, unlike the second storyline, neither the animals nor the products were considered to provide any added value, compared to other breeds. The animals should primarily be kept on the basis of conservation, for example, among the mainstream breeds. This was considered a professional task, not an activity carried out by amateur farmers. Proper conservation also requires that the animals are treated with respect, in relation to their characteristics. In other words, milk cows should be milked. According to this storyline, one cannot conserve genetic resources on a voluntary basis or expect city-dwellers to keep animals. One must be well informed to be able to take care of the breeds.

> 'As a hobby – it cannot be based on ideology, you need industry knowledge, how to take care of the animals according to their needs, it takes 24 hours a day!' (Farmers' Union)

In this storyline, it was essential that conservation is carried out by farmers, who are compensated for the lower yield of the local breeds, in the form of agro-environmental support or payments for ES. Product-based conservation was also considered to improve the image of agriculture to the public, as it helps to understand the role of agriculture in maintaining biodiversity. 'Positive attitude towards rural livelihoods and maintenance of genetic resources'. (Farmer's Union) In that sense, the role of farmers as producers of other ES than provisioning (food, fibre) alone, was emphasised in this storyline.

According to Soini et al. (2012b), farmers differ in their motivations to keep the landraces. The sustainable producers focus on production and economic rationality

similar to the second and fourth storyline. The difference between the second and fourth storyline is that the second is more in favour of active selection and breeding, while the fourth has adapted a 'passive' approach for improving the yield. Overall, the second and fourth storylines emphasised that farming is a real profession that should not to be left to amateurs. It also emphasised that agriculture has several positive side effects on the environment, in this case, that of maintaining biodiversity. The first storyline emphasised the sustainable use of local breeds accordingly to the farmer type, which emphasises the multiple values and uses of local breeds. The hobby farmers named by Soini et al. (2012b) were most strongly represented by the third storyline.

Discussion

We have explored how Finnish stakeholders view the conservation options and sustainable use of local breeds. Our analysis revealed the stakeholders' different standpoints and interests in how they perceived the various means of conservation and use of local breeds, in rural livelihoods. Some stakeholders were in favour of one of the storylines, but brought up different possibilities for conservation and, in particular, the synergies between different means of *in situ* conservation. The ES approach was used to clarify the aims of conservation and the values associated with it, while the concept of biopower helped to explore how these perceptions reflect human-animal relations. In the following section, we will present the results in relation to ES and human-animal relations and discuss the implications of the colliding perceptions.

Storylines in ES framework

Most of the interviewed stakeholders highlighted the production-based nature of local breeds, which is in line with the traditional focus on provisioning services, regarding local breeds (Ovaska and Soini 2016). Product-based use calls for a balance between private and public goods, public appreciation of outputs and acceptability of commodification, and is dependent on the uncertainty and dynamics related to the complexity of management requirements (see also Hodge and Adams 2014). The latter prerequisite applies to all types of *in situ* conservation. Product-based sustainable use is carried out by either private for-profit actors or non-profit actors, such as NGOs (see also Hodge and Adams 2014). The storyline was in favour of respecting the purposes the animals were first selected for: the production of meat and milk. Provisioning services are highlighted, if agriculture is considered to consist of the production of food and fibre (Arovuori and Saastamoinen 2013; Ovaska and Soini 2016). In this sense, even the broadening of farm activities to services, such as tourism (Meraner et al. 2015) is regarded as endangering the 'original' way of using local breeds. Moreover, this has to do with farmer identity being strongly based on food production (Burton 2004).

The ideas represented in the storyline in favour of service-based sustainable use, are in line with farm diversification and likely to gain ground as innovations, such as Green Care, become more widely known and introduced (see, e.g., Meraner et al.

2015). Responsibility for this type of conservation falls to private for-profit actors as well as non-profit actors and the State (see also Hodge and Adams 2014). The storyline emphasises cultural ecosystem services (CES) and aims to improve rural area economic viability, while conserving local breeds. As a concept of ES, local breeds not only produce food and fibre, they are essential for the maintenance of cultural heritage (European Commission 2008; Henle et al. 2008; Ovaska and Soini 2016). Thus, the CES obtained from local breeds not only deals with agricultural policies, but also with environmental and cultural policies (Ovaska and Soini 2016).

Some of the interviewees were enthusiastically in favour of conservation and 'purity' of local breeds. This storyline, which focuses on service-based conservation, aims to find ways of conserving the breeds free of entrepreneurial risks related to farming or other businesses. The animals would be treated as pets and not considered as part of livelihoods. The service-based conservation requires public appreciation of outputs and is run by non-profit actors, such as NGOs (see also Hodge and Adams 2014). In addition to new rural livelihoods, CES highlights the existence and bequest values of the local breeds (Ovaska and Soini 2016), which were also identified in this storyline.

Product-based conservation, that keeps local animals, among other breeds, is an option that aims to place breeds on farms that are not economically dependent on the landraces (see also Tilzey and Potter 2008). Product-based conservation is carried out by private for-profit actors, and public and non-profit private farms (see also Hodge and Adams). In this storyline, the local breeds are conserved only because of their valuable genetic resources and the option for future breeding purposes, provided by them, which highlights their role as producers of regulation and maintenance services.

The perceptions on how *in situ* conservation should be organised, with respect to the characteristics of the animals, strongly differed among the interviewees. These differences reflected the diverse benefits and values of local breeds identified by ES (Ovaska and Soini 2016), on the one hand, and criticism concerning the concept of ES, on the other hand; especially their anthropocentric perception of animals (Schröter et al. 2014; see also Holloway et al. 2009).

Human-animal relations and in situ conservation

The ethical concerns of human-animal interaction were raised in all storylines. Product-based sustainable use stressed that the animals should not be used as 'park cows', which they regarded as downgrading the old landraces. The service-based sustainable use storyline wanted to commercialise human-animal relations by using the breeds in rehabilitation services and tourism. Product-based conservation was the most anthropocentric storyline, recognising the animals and their genes as merely production components. In service-based conservation, a more biocentric perception could be identified, as the animals were conserved for their own sake (see Holloway et al. 2009). This perception considers the local breeds, not as components of livelihoods, but as hobby animals (Holloway 2001).

According to Holloway et al. (2009) animal-breeding is an example of unequal human-animal power relations that raises ethical concerns, which were also identified by stakeholders. The stakeholders who highlighted the original use of the animals, were in favour of breeding, whereas those focusing on hobby or pet uses, considered it a serious threat. This leads to a disagreement between conservation and sustainable use: the breeding option is an essential ES benefit provided by local breeds (Oldenbroek 1999; Ovaska and Soini 2016), and the sustainable use of the breeds may even require it, as understood by the stakeholders in favour of it. However, for conservation purposes, breeding may not be recommendable, as was stressed by those against it.

Ethical questions concerning the use of animals for human benefit were raised by the stakeholders. This perception is essential, as it helps to understand that local breeds are not only animals that can be directly managed, but creatures with intrinsic value and an agency of their own that should influence conservation efforts (Holloway et al. 2009; Jepson et al. 2011). In this sense, the animals should be brought back to focus on matters that concern their own lives (Holloway et al. 2009; Sellick and Yarwood 2013).

Policy implications

Conservation actors are entities with agency, i.e., that there is the capacity to produce a phenomenon or modify a state of affairs, entangled in networks sustained by relationships (Jepson et al. 2011). Therefore, the stakeholders' perceptions on conservation are valuable, even if they seem to complicate the governance of the conservation, as they differ remarkably. The stakeholder interviews revealed what is considered essential, at different levels and sectors of conservation (see also Fisher et al. 2009).

The colliding perceptions lead to challenges regarding the *in situ* conservation of local breeds. The small number of actors, and that of local breeds, engaged in the conservation, in Finland, complicates the situation. It is, thus, challenging to make choices and agree on trade-offs. There have been several attempts to integrate ecosystems and the livelihoods of people to resolve agrobiodiversity-related problems (Henle et al. 2008), but they rarely focus on managing the conflict between various conservation alternatives. The participation of local stakeholders and the dialogue between stakeholders has often proved to be more successful and sustainable in understanding different perspectives and values, than formal top-down approaches (Henle et al. 2008; Ovaska and Granholm 2014). Accordingly, the role of the State has diminished, as new types of conservation actors have emerged (Jepson et al. 2011).

The conservation of agrobiodiversity is multi-sectoral and multi-level; there are networks of governments, the private sector and environmental NGOs, and the solutions to conservation and its challenges are worked out by a wider range of actors (see Logan and Wekerle 2008; Hodge and Adams 2012). The governance networks are formed in relations between these actors; not only humans and organisations, but also collectivities and the animals, themselves, should be considered conservation actors (Jepson et al. 2011). Thus, it might be recommendable to integrate the animals, as well as all aspects of ES into the discussion, to be able to successfully improve the communication between different conservation actors. This is required

for the full potential of the landraces to be used for the enhancement of the rural development (see also Henle et al. 2008).

Conclusions

In this article, we have discussed the possibilities of conservation and the sustainable use of local breeds as a part of rural livelihoods. The stakeholders that we interviewed were able to see different possibilities for using local breeds in rural livelihoods and development, according to the ES framework. However, the views on how conservation should be organised differed from one another. There is no common or widely-agreed vision for the conservation and sustainable use of local breeds. The market-oriented approach of conservation does not fully fit with the conservation of biodiversity, but it provides both challenges and opportunities to conservation, as it identifies agriculture as a producer of ES. The focus on ES emphasises that environment conservation and the needs of rural livelihoods need not to be in conflict. This might be the new solution for combining local breeds and rural development and livelihoods to achieve, or at least to aim for, a common goal. Furthermore, the animals, themselves, should be understood as conservation actors and not only as targets that humans decide on (Holloway et al. 2009; Jepson et al. 2011). A common understanding of conservation and its goals could help at the implementation level to carry out conservation and make long-term decisions and commitments (see also Ovaska and Granholm 2014), although different means of conservation could exist in parallel. Institutional development aims to provide preferences for conservation to influence choices, but alternative models of conservation can operate alongside conventional policy mechanisms and each other (Hodge 2001).

Further research is needed on how these differences affect conservation at the actual implementation level, and how the storylines alter and adjust, in time and space.

Notes

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[1] Millennium Ecosystem Assessment (MA 2005) divides ecosystem services in four categories: provisioning (e.g., food, fibre, genetic material), regulating (e.g., biodiversity control), cultural (e.g. cultural heritage, identity, ecotourism) and supporting (e.g., soil formation, primary production).

[2] The Rural Policy Committee is a cooperation body appointed by the Government. Members come from different ministries and administrative bodies, specialist organisations and various associations. The Rural Policy Programme is the action programme of the Committee. Besides the central government, the measures are carried out by municipalities, associations, educational institutions and other organisations.

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