4 Traditional nutrition of Indigenous Peoples in the Arctic zone of Western Siberia

Challenges and impact on food security and health

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Acronyms

FAO: Food and Agriculture Organisation of the United Nations; RAIPON: Russian Association of Indigenous Peoples of the North; YNAO: Yamal-Nenets Autonomous Okrug.

Introduction

Food security is an important component of national economic security. The Food and Agriculture Organisation of the United Nations (FAO) and the Doctrine of Food Security of the Russian Federation (2010) use this concept to describe the state of the national or global food market. Food security is 'the conditions under which people have physical, social, and economic access to adequate, safe, and complete nutrition that satisfies the needs and preferences in their diet and nutrition for actively healthy living' (Doctrine of Food Security of the Russian Federation, 2010). Its constituent elements are food independence, physical, and economic accessibility of food, and the safety of available food (Rome Declaration on World Food Security and the World Food Summit Action Plan, 1996; Declaration of the World Summit on Food Security, 2009; Doctrine of Food Security of the Russian Federation, 2010).

Policy documents prioritise food security challenges in the Russian Federation, and in some regions (especially in the Arctic region) these challenges are urgent. Professor V.A. Ivanov states that, due to outflow of products the population of the Arctic in Russia is deprived from sufficient access to the products of the region. Thus, Russia does not ensure food security (Ivanov, 2015, pp. 152–174). This problem can require emergency measures at the local and federal levels.

In the Russian Federation, food security should be diversified at the regional level. This is especially relevant in the Arctic zone of the Russian Federation, where quality of life differs significantly between settled populations and the nomadic Indigenous Peoples who live in the tundra. This

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aligns with the FAO Policy on Indigenous and Tribal Peoples (Rome, 2015) (FAO, 2015), which states that, although Indigenous Peoples make up about 5% of the world's total population (and 15% of the total population of the Russian Arctic), about 15% of them live below the poverty line (Rosstat). The FAO Policy declares:

> The adversities faced by Indigenous Peoples have grown in the last few decades, but so too have the recognition of and appreciation for their potential contributions to sustainable development and natural resources management. Protecting the livelihood systems and specialised knowledge that are held within these communities will reverse the steady erosion of indigenous cultures but may also bring novel solutions to the fight against food insecurity and malnutrition, poverty, and environmental degradation.
>
> (FAO, 2015, p. 2)

In 2018, the FAO prepared a regional overview of the state of food security problems in Europe and Central Asia in 2017 (The State of Food Security and Nutrition in Europe and Central Asia, 2018). However, the FAO's findings for Russia are based primarily on statistical data collected from the regions of the Russian Federation. They therefore fail to reflect the real differences in food security between urban and rural areas and between the permanent populations in municipalities and Indigenous Peoples following a traditional lifestyle. There is insufficient data on the quality of life and food security of Indigenous Peoples in the Russian Arctic (SLiCA, 2015; Anderson et al., 2016, pp. 1–27; Kozlov et al., 2018).

However, our research shows that development of Indigenous communities in this region correlates to global factors affecting food security identified by the FAO and the World Health Organisation. Rapidly growing fuel prices have a dual effect, increasing the cost of production and of sales. The growing demand for food in emerging economies and the impact of climate change on agriculture, fishing, hunting, and gathering also affect food security in the Russian Arctic. This is supported by the document *Food Security in the Arctic Region* developed by the Inuit Circumpolar Council (Canada) (May 2012), which identifies two main problems concerning food insecurity of Indigenous Peoples living in the Arctic region: (1) high prices, often combined with economic vulnerability, and (2) reduced consumption of products made from the Arctic flora and fauna (Inuit Circumpolar Council, 2012). The situation is further complicated by global climate change.

Food sovereignty movements challenge the issue of food security (the right to adequate amounts of quality food) and the social relationships of production and consumption. Food sovereignty critically assesses the ability of people, communities, and nations to control their own food systems (markets, modes of production, food cultures, and environments) and to provide an alternative to the neoliberal model of agriculture (Desmarais, 2002, pp. 91–124; Wittmanm, 2009, pp. 120–130). This neoliberal model is

associated with the expansion of the 'third food regime', which refers to the withdrawal of the state and the expansion of market forces via integration with the global food market and the lifting of regulations on the free trade of food, along with the privatisation of food security and the domination of the corporate food regime (Friedmann et al., 1989, pp. 93–117). The third food regime brought about the increasing displacement of local family producers (Van der Ploeg, 2013). Reindeer herder economies integrated into market economies by selling their products to local and external markets; this caused them to become more dependent on complementary sources of food in the form of products produced and distributed to local vendors by external large-scale market ones. Rising fuel costs are one reason for the increasing need for cash incomes.

However, the claims of food sovereignty movements do not completely correspond to Indigenous issues. Lauren Kepkiewicz, Dawn Morrison, Annette Desmarais, and Hannah Wittman point out that food sovereignty in Canada remains disproportionately focused on agricultural production and state solutions while failing to adequately engage with Indigenous food systems based on hunting, fishing, and gathering (Morrison, 2011, pp. 97–114; Desmarais et al., 2014, pp. 1153–1173; Kepkiewicz, 2017, pp. 164–180). Food sovereignty issues for Indigenous People are intertwined with the colonial roots of the regulations around land use by Indigenous People and colonial settlers.

Moreover, food sovereignty for Indigenous Peoples also concerns specifics of their lifestyle. Due to the transformation of the traditional lifestyle of Indigenous Peoples (replacing nomadic lifestyles with settled ones), those who are still involved in traditional occupations (reindeer herding, fishing, hunting, gathering, etc.) have a strong impact on the food sovereignty of Indigenous and non-Indigenous communities since they provide traditional food. According to Lauren Kepkiewicz, not only do indigenous food systems form the basis of Indigenous Peoples' ability to sustain and nourish themselves, but indigenous food systems form the basis of all people's food systems (Kepkiewicz, 2015, pp. 185–198). Dawn Morrison points to Indigenous food sovereignty as a restorative framework for the transformation of food systems to which all people and cultures – Indigenous and non-Indigenous – can relate (B.C. Indigenous Food System Network, 2008, pp. 1–22).

This is relevant to the present case because the Indigenous People who live in national settlements in Western Siberia still depend to a significant degree on traditional sources of nutrition. So, the issues of Indigenous Peoples' food security and food sovereignty are both global and specific, and these issues align with many geographical, cultural, and socio-economic specifics.

Since the concern for food sovereignty emerged from the social movements of producers, it is worthwhile to explore how food sovereignty emerges in the relationships among the state, the market, and producers. P. Clark juxtaposes ideas of food sovereignty that promote a '"*Westphalian" state-centric notion* [with] those implying a more *pluralistic notion of sovereignty* over territories by non-state actors (Clark, 2016, pp. 183–205).

As this chapter will show, in Russia, the state takes an active role by regulating reindeer herd sizes and access to grazing to protect traditional lifestyles. Reindeer herders have organised to 'fight' for more influence over national and international policies. Meanwhile, reindeer herding can be also seen as a continuation of the 'silent resistance' of the 'people's economies' (Visser et al., 2015, pp. 513–528) of the state socialist period. Reindeer herders retained an Indigenous, autonomous, household-based food system parallel to the dominant state-run, socialist, planned economy. Following the postsocialist transition, reindeer herding has continued to have a strong standing; it embraces an Indigenous food system even during its emergent market integration.

This chapter describes current trends related to the food security and food sovereignty of the Indigenous population in the Arctic zone of Western Siberia (Yamal-Nenets Autonomous Okrug – YNAO) (Figure 4.1).

This region is the part of the High North, and more than half of its territory is located above the Arctic Circle. There are three climatic zones: (1) the Arctic, (2) subarctic zones, and (3) the northern part of the Western Siberian lowlands. This chapter considers only the Arctic region. Its climate is determined by the permafrost. It is characterised by long, cold, severe winters (up to eight months) with strong magnetic storms, frosts, frequent snowstorms, and a short summer (50 days). The average annual temperature is about −10°C. In winter, low temperatures can sink to −70°C; in summer (in July), the temperature can rise to +30°C. This severe climate makes industrial agriculture impossible, but the sustained cold temperatures provide the necessary conditions for reindeer herding.

The Indigenous population's food security and sovereignty are based on maintaining traditional nutrition, which is an important part of the nomadic Indigenous population's traditional culture and the Indigenous economies in the Arctic zone of Western Siberia. Traditional nutrition effectively prevents health problems and allowed Indigenous Peoples of this region to adapt to the cold and geomagnetic activity of the High North. 'Traditional nutrition' is a diet that contains more than 50% local, traditional products (i.e., venison, local fish, etc.) (Lobanov et al., Traditional nutrition…, 2018, pp. 32–33). Dramatic transitions away from Indigenous nutrition have significantly affected the prevalence of respiratory diseases, circulation problems, and obesity, and reductions in the consumption of traditional foods lead to a decrease in adaptation (Andronov et al., The impact…, 2018, PA796; Andronov et al., The role…, 2018, pp. 142–144; Bogdanova et al., 2018, pp. 120–126; Lobanov et al., Study…, 2018, pp. 31–32).

Food security issues differ for different Indigenous populations (fishermen, hunters, or nomadic reindeer herders). Food security concerns access to natural resources as well as obtaining hunting licenses and fishing quotas for Indigenous communities. This study investigates whether national policies and the current trends in reindeer herding in the Arctic zone of Western Siberia reflect issues of food security and sovereignty. It considers four main aspects of these topics: policies, environmental issues, economic and health impacts.

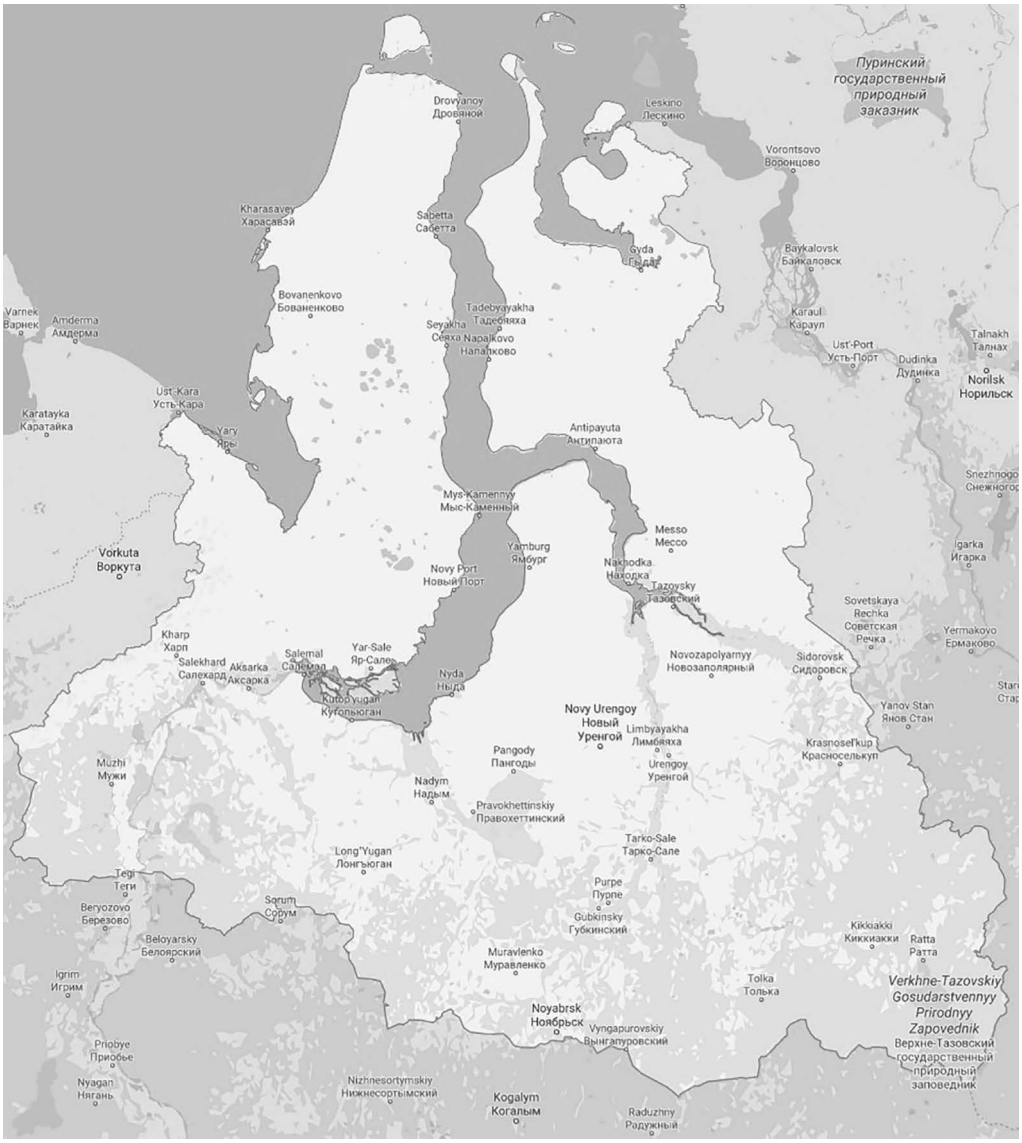

Figure 4.1 The territory of the Yamalo-Nenets Autonomous Okrug.

The chapter takes a multidisciplinary approach that draws on methods used in the fields of law, sociology, economics, and medicine. Research was conducted using the actor–network theory, a sociological method. A comprehensive analysis of socioeconomic factors affecting reindeer herding maintenance was also conducted. The primary sources used in this study include data collected from interviews and surveys of 590 Indigenous Peoples

(reindeer herders) during expeditions to the Nyda settlement, the Nydinskaya tundra, the Tazovsky settlement, the Tazovskaya tundra, the Nakhodka tundra, the Gyda and Gydansky settlements, the Yavai-Salinskaya tundra, the Seyakha settlement, the Seyakhinskaya and Tambeyskaya tundras (located along the southern coast of the Ob Bay), the northeast coast of the Yamal Peninsula, and the Tazovsky and Gydansky Peninsulas. Data were collected in summer (August) and winter (March and November) in 2014–2017 (Figure 4.2). Fieldwork was conducted by the researchers of the YNAO (Yamal-Nenets Autonomous Okrug) Arctic Scientific Research Centre.

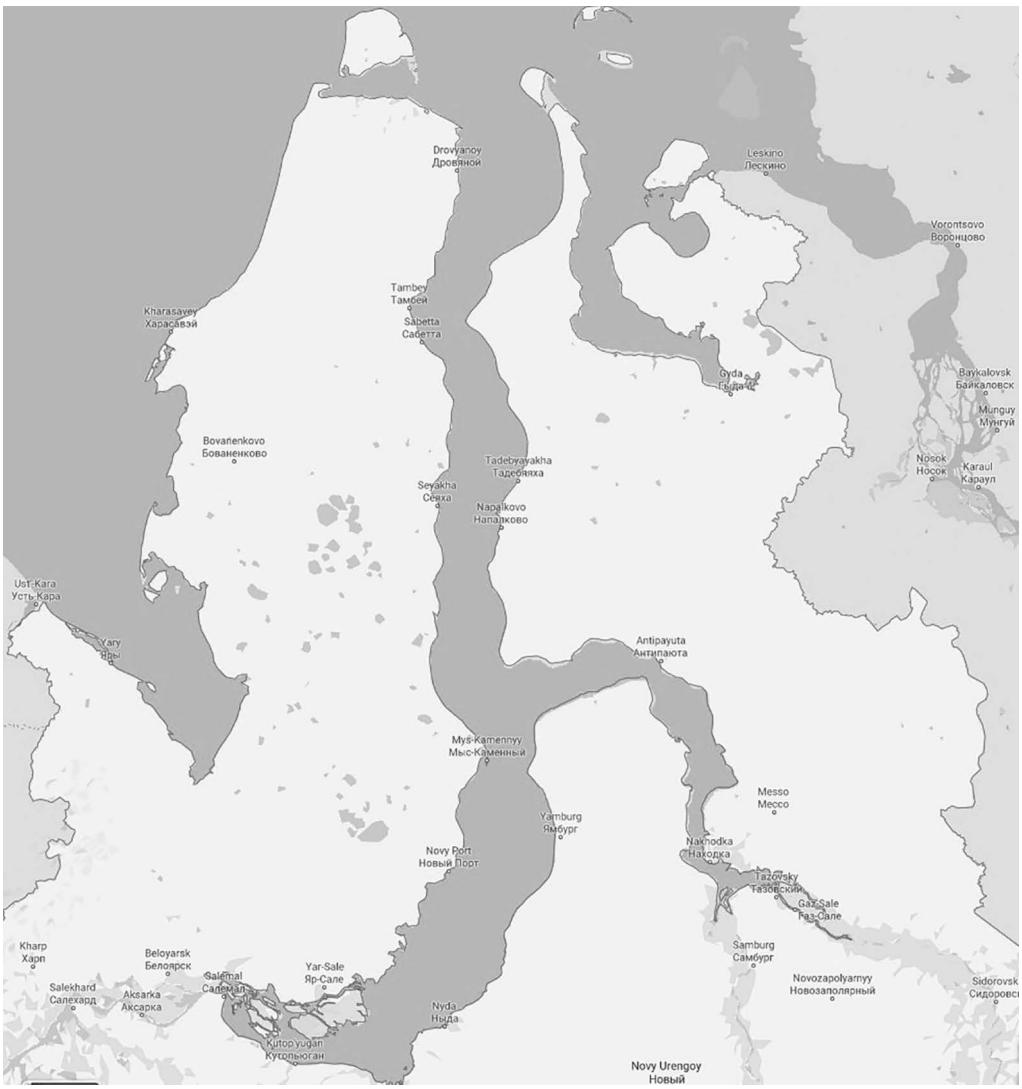

Figure 4.2 The territory of the Arctic climatic zone of the Yamalo-Nenets Autonomous Okrug.

Two hundred and fifty-two semi-structured interviews were conducted based on the interview guide developed and approved by the YNAO Arctic Scientific Research Centre. Two hundred and thirty-eight surveys with fixed questions were received. The results were analysed using STATISTICA 6.

The selection criteria for the respondents were involved in reindeer herding, Nenets origin (at least one parent was of Nenets origin or a participant was a Nenets speaker), nomadic or semi-nomadic lifestyle, and participation in a medical examination conducted by the YNAO Arctic Scientific Research Centre. All participants over 18 years of age provided written informed consent. Participants' personal data were anonymised, numbered, and added to the databases of the Northern Arctic Federal University project team.

Secondary sources used in the study consisted of official information requested from local authorities, public statistical data, and official government reports.

Settings

The Arctic zone of Western Siberia (YNAO) is a unique territory because almost 1/3 of the Indigenous population of the Russian Arctic (about 42,000 people) reside there, including Nenets, Khanty, Selkups, and Komi-Zyryans. Almost half of the residents are still nomadic (about 22,000 people). The culture, health, and social well-being of Indigenous Peoples are strongly linked to a traditional lifestyle and the consumption of traditional food. Therefore, it is essential to encourage traditional occupations (reindeer herding, fishing, hunting, etc.) in this region in order to preserve the Indigenous population.

The geographic location of YNAO, which is mostly above the Arctic Circle, significantly impacts traditional occupations in this region; its conditions are the most appropriate for reindeer herding.

Current trends in the traditional economy of reindeer herders in YNAO are fundamentally different from economic trends in other Arctic regions. Worldwide, the number of people following a nomadic lifestyle is decreasing, but in YNAO, it is increasing, as is the number of young men engaged in reindeer herding.

Policies affecting the food security of Indigenous Peoples in the Arctic zone of Western Siberia

The first legislative initiatives to support reindeer herding were in the 1920s and 1930s. During WWII, the Soviet government adopted new legislation aimed at preserving and developing the reindeer industry. However, only since the 1990s it has national policy focused on maintaining the Indigenous population and their traditional lifestyle. Efforts in this direction have led to the formation of associations of Indigenous Peoples and a set of federal and local (municipal level) acts, including *On the Territorial Public Self-Government in Yamal-Nenets Autonomous Okrug* (Law No. 44, 9 December 1996), *On Reindeer Herding* (Law No. 46, 2 November 1998;

Law No. 34-ZAO, 6 June 2016, ed. 2 October 2018), and *On the General Principle of Organising Communities of Small Indigenous Peoples of the North, Siberia, and the Far East of the Russian Federation* (Federal Law No. 104-FL, 20 July 2000). However, issues related to reindeer husbandry are mostly regulated on the local level because the draft federal laws, such as *On Northern Reindeer Herding* (No. 97700749-2, 1997 and No. 220824-3, 2002), were rejected by the State Duma of the Russian Federation.

The regional YNAO law *On Reindeer Herding* (Law No. 34-ZAO, 6 June 2016, ed. 02 October 2018) establishes two types of reindeer husbandry: individual reindeer herders and reindeer herding households. The first is a collaboration of Indigenous or non-Indigenous Peoples of the North, or other persons who are not members of the Indigenous Peoples of the North but are permanent residents of the Okrug and follow the traditional lifestyle of Indigenous Peoples of the North. They engage in traditional economic activities and traditional occupations in the areas of traditional residence and traditional economic activities of the Indigenous Peoples of the North (On Reindeer Herding, 2016, article 3, par. 5). This definition partly correlates to 'a peasant (farm) household' (Civil Code of the Russian Federation, 1994, article 86.1), which describes 'citizens conducting joint activities in agriculture without establishing a legal entity on the basis of an agreement for running a peasant (farm) household or entitled to create a legal entity – a peasant farm' (Civil Code of the Russian Federation, 1994, 23). In contrast, reindeer herding husbandry refers to individual entrepreneurs and legal entities that herd reindeer as a business (On Reindeer Herding, 2016, article 3, par. 6). However, none of these legal definitions provides quantitative measurements to determine the status of a reindeer herder.

In the late 1980s and 1990s, the main stakeholders protecting the rights of Indigenous Peoples appeared. On 12 December 1989, the organisation '*YASAVEY*' was founded. In 1998, it was renamed *the Association of the Nenets People of Nenets Autonomous Okrug* '*YASAVEY*'. This association joined *the Russian Association of Indigenous Peoples of the North 'RAIPON'*, which was founded in March 1990 at the Congress of the Peoples of the North. At first, the Association '*RAIPON*' was called the Association of the Peoples of the North of the USSR and united 26 indigenous minorities from the North. On 24 November 1993, it was registered as a socio-political movement – the Association of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation. This association lobbies for the interests of Indigenous Peoples in the Russian Federation. It works in collaboration with the chambers of the Federal Assembly of the Russian Federation, the government, and the President of the Russian Federation, and it participates in work on legislation designed to ensure the rights of Indigenous Peoples and to help them to maintain their lifestyle and develop their economy. It has a special consultative status with the UN Economic and Social Council (ECOSOC), and is an active participant in the sessions of UN working groups on Indigenous issues. It helped to develop the draft Declaration on the Rights of Indigenous Peoples and also participates in

the Commission on Human Rights and the UN Permanent Forum on Indigenous Issues. '*RAIPON*' is a permanent member of the Arctic Council, which was established by eight Arctic countries: Norway, Denmark, Sweden, Finland, Iceland, Canada, the US, and Russia. Its experts take part in various Arctic Council working groups and programs. These activities make '*RAIPON*' the strongest stakeholder involved in protecting the civil rights of Indigenous Peoples in Russia. It has had a significant impact on governmental programs and legislative initiatives, including:

- *The Conception of Sustainable Development of Indigenous Minorities of the North, Siberia, and the Far East of the Russian Federation*, approved by governmental decree of the Russian Federation on 4 February 2009 (No. 132-P);
- *The Conception of Sustainable Development of Indigenous Peoples of the North in Yamal-Nenets Autonomous Okrug*, approved by a resolution of the YNAO Legislative Assembly on 9 December 2009 (No. 1996);
- *The Strategy of Socio-Economic Development of YNAO until 2020*, approved by a decision of the YNAO Legislative Assembly on 14 December 2011 (No. 839);
- *The National Program of the Indigenous Peoples of the North in YNAO*, approved by a decree of the governor of YNAO on 28 December 2017 (No. 132-PG);
- The YNAO state program *Development of the Agricultural Complex, Fisheries, and Regulation of Markets for Agricultural Products, Raw Materials, and Food in 2014–2021*, approved by YNAO governmental decree on 26 November 2013 (No. 964-P, ed. 16 August 2018);
- The complex program *Sustainable Development of Indigenous Peoples of the North in YNAO in 2018–2020*, approved by YNAO governmental decree on 12 December 2018 (No. 1271-P).

However, local policies governing reindeer herding and husbandry still have many gaps that affect the efficiency of the Indigenous economy. According to Konstantin Filant, a researcher at the YNAO Arctic Scientific Research Centre, the legislation on reindeer herding in Russia is insufficient. The laws are poor quality because they are formulated using terms from ethnology and history rather than clear legal language (Filant, 2017, pp. 31–47). Furthermore, the legislation is neither based on the existing norms of land and civil law, nor does it aim to protect citizens. In addition, its focus on Indigenous People's rights overlooks the need to consider environmental issues as well. Therefore, the number of reindeer permitted per herd under current legislation is not based on pasture capacity.

The next section of this chapter considers some important issues about the relevance of these regulations. The issue of decreasing pasture capacity in tundra areas is urgent, and the impact of existing models of reindeer herding on the environment must be addressed. There is a conflict between

reindeer herders' decreasing standards of living (and the herders' efforts to survive and increase their profits by increasing the size of their herds) and the growing degradation of reindeer pastures in the tundra (which affects reindeer's health). Another issue is herders' growing need to get involved in market activities because they have little or no access to the necessary facilities for reindeer slaughter and the storage of reindeer products.

The interaction between grazing capacity and models of reindeer herding

Reindeer husbandry in YNAO today is an example of the successful integration of traditional occupations into the modern economy. It is the main traditional occupation and business of the nomadic Indigenous Peoples of the Tazovskaya, Messoyakhinskaya, Antipayutinskaya, and Tanamskaya tundras (Figure 4.2), most of whom work in commodity production of reindeer meat and antlers. The reindeer herders of the Tazovsky district differ widely in methods of cooperation and economic interests. They can be divided into three groups by the number of reindeer in a herd: small-scale herders (fewer than 100 reindeer per herd), middle-sized herders (100–999 reindeer per herd), and large-scale herders (over 1,000 reindeer per herd) (see Table 4.1).

Many communities in the tundra today are shifting from a subsistence economy (in which the primary goal is providing a family with food) into commodity production (in which the goal is to earn income from sales of a product). Large-scale reindeer herding is well-suited to this new model of Indigenous business. For a long time, reindeer herding involved temporary collaborations of relatives based on informal agreements. Only in 2019, the first reindeer farm was registered in the Seyahinskaya tundra in YNAO. This official legal status allows herders to apply for subsidy programs and other government support for breeding reindeer and processing meat.

Table 4.1 The structure of reindeer herding households in the Tazovskiy region in 2018

Model of reindeer herding	*Transport reindeer*	*Reindeer for food*	*Other reindeer*
LARGE-SCALE			
Mean number of reindeer per herd	2060	40	4900
Share in a herd, %	29.42	0.57	70.01
MIDDLE-SCALE			
Mean number of reindeer per herd	55	18	232
Share in a herd, %	18.03	5.09	76.88
SMALL-SCALE			
Mean number of reindeer per herd	30	10	110
Share in a herd, %	20	6.6	73.4

Unfortunately, ecologists conclude that further extensive growth could cause an environmental catastrophe due to overgrazing (Kryazhimskiy et al., 2011, pp. 323–333; Yuzhakov, 2017, pp. 131–137). This would, of course, endanger the population's primary food source (Morozova and Magomedova, 2006, pp. 235–249). However, local governments still pay little attention to pastures' capacity to support reindeer. Most reindeer herders in the Tazovskaya, Tanamskaya, Gydanskaya, and Yuribeyskaya tundras are complaining about the reduction in quality of winter reindeer pastures. The residents of the Esseyahinskaya and Yavai-Salinskaya tundras (Figure 4.2) are not yet experiencing these problems.

Expeditions organised by the YNAO Arctic Scientific Research Centre have found the most significant damage to pastures in the Antipayutinskaya tundra near 'waiting' areas (temporary camps) close to the settlements where reindeer herders make purchases (i.e., in Yuribey, Tanama, Antipayuta, and Gyda); in fishing areas on the gulf of the Ob River (north of Antiputa, on the western shore of the Yambuto lake, and on the shore of the Gydan Bay near Yuribey); and near oil and gas deposits where nomadic people sell fish and venison and buy gasoline (mostly at the deposits of the Messoyakhinskaya group). Overgrazing is accompanied by soil degradation around populated areas near infrastructure facilities, and the consequence of overgrazing is a lack of nutrition for reindeer, which leads to deteriorating health (Figure 4.3).

However, more than 80% of the surveyed reindeer herders do not consider the situation to be critical. They think that 'a reindeer finds its own food; the main thing is not to interfere with them', and 'the tundra will regulate itself'. They are convinced that reindeer are adapting to changes in their food supply.

Figure 4.3 The damaged teeth of a three-year-old reindeer as a result of eating low lichen cover in the areas of overgrazing in the Messoyahinskaya tundra, the Lucemer-Yakh camp, 2017.

In recent years, climate change (which has caused hot summers and a long snowless season) has led to an increase in the biomass of herbaceous plants. In addition, the thawing of permafrost has resulted in the formation of small ravines, improving drainage in the territory, and creating better conditions for plant growth. These climatic changes have led to an increase in grassy plants in reindeer's winter diets (Morozova and Magomedova, 2006, pp. 235–249; Kryazhimskiy et al., 2011, pp. 323–333; Yuzhakov, 2017, pp. 131–137). Less than 20% of the surveyed reindeer herders were worried about climate change and said that they had moved further north with their herds because increasing temperatures were uncomfortable and harmful for reindeer.

Reindeer herders with herds of up to 300 reindeer believe that large-scale reindeer herding is the main problem. After a large herd of 2,000–3,000 reindeer grazes, the tundra needs a long time to recover. This aligns with the 'tragedy of the commons' proposed by Garrett Hardin (Hardin, 1968, pp. 1243–1248). Nobody wants to lose profit, and common natural resources are easily exhausted. This results in pasture degradation, which could be tragic for the tundra and reindeer herding.

The owners of large herds, meanwhile, believe that small-scale herders cause more damage since they follow shorter migratory paths and often stay at settlements and trading stations for long periods or even cease to migrate altogether. However, reindeer herders strongly oppose governmental regulations limiting the number of reindeer in a herd, and there are still no legal, economic, or social precedents for herd reduction under discussion by regional authorities.

The solution to overgrazing issues can be found in regulating nomadic reindeer routes based on the old Soviet system. Under this system, all reindeer herders were required to move from winter pastures to summer ones by crossing the rivers that flow east–west near Antipayuta, Tanama, and Gyda settlements. Younger reindeer herders find this model fair, effective, and easy to understand. However, there are some doubts whether it would work in the Tanamskaya and Messoyakhinskaya tundras. Many reindeer herders in these districts do not go far from the oil and gas deposits.

Marketing capacities of reindeer herders

Changes in export trends also impact traditional food consumption. Local venison and fish are necessary to maintain the health of reindeer herding families and also of Indigenous Peoples who live in settlements or towns. Until recently, a substantial portion of venison was sold in the nearest settlements or urban areas, but this has changed dramatically in recent years. In the national villages that do not have their own facilities for the slaughter and storage of reindeer products, venison consumption decreased by 20%–48% over the last five years (2014–2018). Such facilities only work with large exporters and are mostly located in the towns. In Canada, Indigenous communities have faced similar problems: a lack of freezers to store food

and insufficient access to markets with cheap, high-quality food have become barriers to food security (Chan et al., 2006, pp. 416–431). However, in the Arctic zone of Western Siberia, developing the infrastructure to store the production of Indigenous businessmen (local venison and fish) in the national settlements could shift the current export trends, increasing the availability of traditional food to residents of this territory.

Strict government limitations on informal trade ('trade from sledges', the typical method for selling to local communities), which are considered illegal business activities, also discourage reindeer herders and fishermen from selling their products in national settlements. Instead, they sell in bulk to export companies. At the same time, some reindeer herders focus on the export of antlers and pants, treating meat as an accompanying product. This is due to the lack of storage facilities and to the higher profits on these items, as well as the lack of delay in payment for them. Meanwhile, payment for venison can be delayed for three to six months. Yet another reason for reindeer herders' focus on antler and pants sales is the difficulty in receiving veterinary approval for the sale of venison because of the lack of veterinary facilities near slaughter sites. Companies that export antlers and pants provide reindeer herders with food, fuel, transport, and spare parts for vehicles and other devices on credit for the following year's 'harvest'. All of this makes the sale of antlers and pants more attractive. The issue is complicated still more by the distance of nomadic routes from settlements and the lack of fuel, petrol stations, and other infrastructure along the routes. These factors combined make selling venison inside the Okrug unprofitable.

Currently, residents in settlements in the Arctic zone of Western Siberia consume venison only five to six months of the year. Indigenous residents' insufficient consumption of venison can severely impact their bodies' ability to handle the harsh Arctic conditions, resulting in an increase in circulatory, respiratory, and metabolic disorders (Lobanov et al., Consumption…, 2018, pp. 190–194; Lobanov et al., Risk factors…, 2018, PA799; Lobanov et al., The impact…, 2018, PA796, Lobanov et al., The role…, 2018, pp. 156–157). Reindeer herders prefer to sell venison to shift workers near oil and gas deposits.

There are several reasons for this restricted access to venison. During summer calving, tundra herders deliver almost no meat to relatives living in the settlements. However, the lack of venison is strongly related to recent changes in reindeer herding. Modern reindeer herding is rapidly ceasing to be a subsistence activity and becoming a form of commodity production. According to our research in the Gydanskaya tundra (2014–2017, $n = 149$), reindeer herders' families use several devices that consume electricity: TVs (58%), satellite phones (26%), and computers (36%). A generator consumes about three litres of gasoline per day. Many families also have two or three snowmobiles and a motorboat. Therefore, a typical reindeer herder's family in the Tazovsky district uses four to eight barrels of fuel per month. To buy fuel, they need money, which can only be obtained by running a commodity production business. This motivates reindeer herders to stay closer to

settlements, factories, roads, and fields where they have access to fuel, imported products, medical care, schools, and the Internet. So, they provide settlements with venison for reasonable prices. They also sell other products (antlers and pants) near settlements because export companies offer higher prices when reindeer herders sell near roads or settlements. As a result, over the last 16 years (1992–2017), in the Gydanskaya, Yavai-Salinskaya, Tanamskaya, and Essiahinskaya tundras of the Gydansky Peninsula, the average length of reindeer herders' routes has reduced by almost 50%: in 1992, the average route was 380 km; in 2017 – 180 km.

However, the proximity of temporary nomadic camps to national settlements has also strengthened the transformation of the traditional lifestyle. The nomadic population has access to imported products which partly replace traditional food. However, these imported products are usually low quality and very expensive. Their consumption also contributes to the increased risk of chronic obstructive bronchitis, obesity, and has decreased Indigenous Peoples' level of adaptation to the harsh conditions of the Arctic (Andronov et al., Prediction…, 2018, pp. 54–67; Kochkin et al., 2018, pp. 130–131).

Implications of ecological and marketing concerns about reindeer herding

Regional and federal strategies concerning reindeer herding must consider the social, economic, and ecological aspects of sustainability.

- The overriding social dilemma is whether to maintain the traditional lifestyle and diet or to find new ways to replace the nutritional value of traditional foods for the subsistence of the Arctic population. It is also important to ensure the participation of local communities in issues concerning their development.
- The overriding economic dilemma is whether to preserve traditional farming that focuses on venison production or to maximise the profits of the reindeer husbandry and integrate reindeer husbandry into the world economy by developing the antlers market.
- The major ecological dilemma is whether to foster the transition to modern technologies for feeding reindeer and the development of nomadic reindeer herding or to limit the number of reindeer in a herd.
- Another dilemma is caused by the conflict between protecting the tundra from overgrazing and increasing the welfare of herders.

At the same time, some tactical issues must be addressed:

- There is a lack of legitimate mechanisms for regulating the number of reindeer and their routes. Since there are no legal, economic, or social precedents for herd reduction, the most likely outcome is the natural

regulation of the number of reindeer due to adverse weather conditions or a significant economic change that causes antler reindeer herding to become unprofitable. Therefore, it is necessary not only to develop a strategy for regulating the number of reindeer if there are too many but also to prepare for conditions leading to a sharp decline in the number of reindeer. Decreasing the number of reindeer could cause some reindeer herders to go bankrupt, forcing them to exchange this traditional occupation for fishing. This could then lead to overfishing. However, reducing the consumption of traditional food (fish and venison) would lead to an increase in circulatory and respiratory diseases among the Arctic population.

- The problem of overgrazing is extremely politicised. Geobotanical studies have mostly been conducted in areas that are not grazed by reindeer. Therefore, overgrazed areas have not been studied. However, the results of these studies have been extrapolated to large areas with very different landscapes and climatic conditions. Furthermore, all studies were conducted in summer. Since weather conditions and vegetation vary significantly during the snowless period of the year in YNAO, it is quite difficult to generalise these results or to use them to develop forecast models. Overgrazing should be monitored using satellite images, and reindeer migration routes should be studied by attaching GPS trackers to reindeer.
- The reindeer counting mechanism currently in use is ineffective. Since official data on the number of reindeer and on pasture resources are extremely inaccurate, they cannot be used to develop models. There is no precise map of reindeer routes, nor is there reliable information about the owners of most of the reindeer in the Tazovsky district.
- There are no petroleum stations or gasoline storage facilities in the tundra, which leads to extremely high fuel costs and significantly affects the welfare of the people living there. When petrol prices rise or there is a shortage, frequent trips to the settlements become impossible for most nomadic families. This in turn limits the availability of medicine, industrial goods, and imported food. It also limits communication with children studying in settlements and reduces the supply of traditional food to relatives in the settlements. In addition, high fuel prices exacerbate overgrazing, as tundra residents tend remain close to settlements or oil fields so they can buy fuel at lower prices, reducing the cost of delivering goods to tundra.

Special measures are needed to address these issues and to maintain traditional reindeer herding. Reindeer herding should be included in the YNAO state program *Development of the Agricultural Complex, Fisheries and Regulation of Markets for Agricultural Products, Raw Materials and Food in 2014–2021*, which was approved by YNAO governmental decree on 26 November 2013 (No. 964-P, ed. on 16 August 2018). Subsidy programs

(included in the budget of this decree) can support reindeer herders and motivate them to comply with the restrictions and recommendations of the authorities. However, we recommend that the criteria for determining the size of a herd be re-evaluated. The most important factors should be: (1) pasture reindeer capacity; (2) the minimum number of reindeers per herd for reindeer herding (as a criterion for maintaining a nomadic or settled lifestyle); and (3) the subsistence minimum (as a criterion for the minimum size of a one family's reindeer herd). Another criterion should be considered when assigning subsidies – the volume of delivered or sold meat. Therefore, government support should be based not only on the number of reindeer per member of the Indigenous family but on the type of reindeer herding, pasture reindeer capacity, the standard of living in the region (subsistence minimum), the average market price of venison, and the demographic characteristics of a family.

Conclusion

In the Russian Arctic, the issues of food security and food sovereignty pose a challenge that threatens the maintenance of Indigenous Peoples' health and traditional lifestyles. Short- and long-term measures are needed. These measures should support the survival of the traditional lifestyle and strengthen the economic position of reindeer herders, who are experiencing increasing market exposure and a need for more cash.

Urgent short-term measures

- Modify communication between local authorities and reindeer herders. Instead of top-down regulations, authorities should collaborate with local communities and reindeer herders to maintain traditional lifestyle, improve the welfare of Indigenous Peoples, and develop reindeer herding.
- Develop systems to monitor the locations of nomadic reindeer herders using satellite phones (which can also enable them to access help in emergency situations). The Ministry of Emergency Situations, regional authorities, veterinary services, Federal Service for Supervision of Consumer Rights Protection and Human Welfare, and hospitals should be able to access the locations of reindeer herders if needed.
- Organise veterinary facilities and venison storage facilities in the national settlements. Indigenous Peoples are drawn into market relationships, but they lack the facilities and infrastructure to profit from their business activities. This lack of infrastructure encourages overuse of nature (overgrazing); proper infrastructure would make venison processing more cost effective.
- Provide reindeer herders with reasonably priced fuel, drinking water, and heated tents in temporary camps near the national settlements

and trading spots. The lack of petroleum stations and storage gasoline facilities forces herders to buy fuel at high prices, and fuel represents a significant portion of a reindeer herders' family budget. Fuel prices force them to limit other expenses (food, goods, medications, travel to national settlements, etc.), which significantly impacts their welfare.
- Organise mobile slaughter and supplemental reindeer feeding facilities in the tundra along the nomadic routes of reindeer herders based on the data from the monitoring system.

Long-term measures

- Implement risk management to avoid overgrazing; monitoring nomadic reindeer herders' routes is a part of this.
- Develop a year-round cycle of reindeer herding and husbandry (*slaughter – storage – processing/production – logistics/delivery – sale*) in the tundra using new methods for the complete processing of reindeer beef. Subsidise the harvest and delivery of reindeer products and increase their profitability. Train Indigenous Peoples to harvest and process reindeer beef according to bioproduction standards.
- Regulate nomadic reindeer routes in the areas affected by overgrazing by monitoring these routes (with GPS trackers attached to reindeer). Determine nomadic routes in close collaboration with reindeer herder representatives. Require reindeer herders to follow assigned nomadic routes to receive subsidies.
- Subsidise fuel for reindeer herders and develop infrastructure to facilitate the economic empowerment of reindeer herders.
- Support reindeer herding in the forest zone of YNAO. Encourage small-scale reindeer herders to relocate to the southern areas of the district where overgrazing is not a problem and there is more infrastructure in place.
- Monitor the consumption of traditional food, and the health and social welfare of the Indigenous population in the Russian Arctic. Explore ways to optimise and enrich their diet while reducing the consumption of traditional food.

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