Promoting Sustainability within the Nordic-Arctic Region's Food System

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Review

Promoting Sustainability within the Nordic-Arctic Region's Food System: Challenges and Trends

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Abstract: The food system has direct impacts on our health both at individual and planetary levels; however, there is a need to make it more sustainable. Many communities in the Nordic-Arctic region are faced with challenges that arise from the need to protect natural resources due to increased activities that are fostered by tourism in the region. In this paper, we explore the interrelated factors that can sustainably support the food system in the region. A better understanding of these associated challenges in a complex food system from production to consumption is required. In order to ensure sustainability in the future, it will be necessary to explore the impacts of food tourism while responding to megatrends in the society. It is important that the natural resources in the communities of this region are better preserved for the next generation. Traditional knowledge and digital solutions can be harnessed to support food security and sovereignty that can empower local communities of the Nordic-Arctic region without compromising their heritage and sustainability.

Keywords: food security; food sovereignty; traditional foods; tourism; Nordic-Arctic region

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1. Introduction

The food system encompasses all the processes associated with food production and food utilization: growing, harvesting, packing, processing, transporting, marketing, consuming, and disposal of food waste [1]. Food can explain the identity of a culture through what and how people eat. When we travel to different places we often take along the images from landscapes and the emotional experience from food with us. How these are related to sustainability will be important topics for the future.

As we develop better means of mobility and communication in our society, people are interested in discovering new experiences and cultures. There are growing interests to explore different cultures especially among the younger generation; as people interact, they also accept new trends that are popular. An important aspect related to this is food tourism, which can enhance biocultural heritage that connects people to the land and water. Food tourism (also known as culinary tourism or gastronomy tourism) is a direct subset of cultural tourism, drawing from ingredients of a region and from the intangible heritage and traditions of host cultures [2]. Although, 'food' has long been considered a key element of the tourist experience, food tourism has become a subject of study relatively recently [3]. The Culinary Tourism Alliance (CTA) maintains that food tourism includes any tourism experience where a person interacts with food and drink that reflects the local cuisine, heritage, or culture of a place.

Biocultural heritage of the natural resources (both terrestrial and aquatic) is known to be held collectively and transmitted from one generation to the next. It includes thousands of traditional crops and livestock varieties, medicinal plants, wild foods, and wild crop relatives that can be processed into foods. Food culture often includes the practices,

thoughts, and beliefs that surround the consumption of food, as well as its production and distribution. The tourist industry provides the possibility for travelers to have a good impression of their new environment through a well-planned guide that is engaging and safe. Gastro-terra food tourism is on the rise and will be more relevant in the near future.

The unique Nordic-Arctic environment, clean air, silence, and cold weather has been very attractive to many tourists. However, the Arctic region has warmed more than double the global rate; this is called "Arctic amplification", according to a majority of scientists, and is caused by climate change as a result of human activities [4]. Although the Nordic-Arctic region is diverse in many aspects, certain common traits can be identified. For instance, in the Nordic-Arctic region, a similar view on tourism development is shared. The development of tourism entrepreneurship, in versatile forms, can be observed in the region [5]. With the movement of people, more traffic along the sea-ice routes will likely increase gastro-terrestrial food tourism in the region. However, in terms of sustainability, it will be important that tourism entrepreneurship is not only economically centered but should also be ecologically centered [6]. Therefore, this review article addresses the relevance of food tourism as a vital business to preserve bioculture in a complex food system with special reference to the Nordic-Arctic region.

The methodology is based on a thematic literature review. We examined Nordic-Arctic publications in English and Finnish languages that are related to the food system. The emphasis was on readings from the Arctic Studies Program course at the University of Lapland, Rovaniemi, i.e., the food security elements of human security, conference proceedings of the 10th Circumpolar Agriculture conference in March 2019, Nordic Council of Ministers publications on food trends, Food and Agriculture Organization (FAO) publications, and book chapters at the Arctic Centre on food system in the Arctic Barents regions were reviewed. A virtual workshop with twenty-five participants (researchers and students) on the Nordic-Arctic food system was organized as part of Arctic Studies Program course. The authors agreed after a three-day follow-up virtual workshop in January 2021 to identify the interrelated factors that can support food tourism sustainably in the region. These factors were discussed in the workshop as themes that can enhance biocultural heritage within the food system. We reviewed studies on food sovereignty as a means of empowering the local people, the need for efficiency in the food-energy-water nexus, reaching out to the global market, sustainable personal food choices as emerging trends, digital solutions in response to the climate change and pandemic crisis. For example, the commodification of reindeer products implies several challenges for the social, economic, and ecological aspects of the traditional food system. Another challenge is how this value addition can interact with the rights of Indigenous peoples to control access to know-how, materials, and benefits of value-adding activities. An overview of the challenges and the current trends in the Nordic-Arctic region is shown in Table 1 below.

Table 1. Challenges and trends based on the themes related to the Nordic-Arctic food system.

Themes	Challenges	Trends	References
Food security and sovereignty	The impacts of climate change on ecological dynamics and consequently access to traditional foods. Dependence on imported foods	Emphasis on sustainable local food production and food security. Value addition and automation to reduce waste in wild berries	[7–10]
Efficiency in processing and value chain	The desire to reduce the number of steps food goes through from production to plate. Energy and water inputs to process foods	Value addition and automation to increase food supply and reduce waste, e.g., in wild berries. Adoption of the green economy.	[8,9,11]

Table 1. *Cont.*

Themes	Challenges	Trends	References
Local taste to the global community	Maximizing the utilization of biological resources and supporting food business and tourist operators to include native animals and plants in local processing.	A growing need to satisfy local food needs or maximize its export potential by developing production linkages	[12,13]
Sustainability through digital solutions	Issues of adulteration and food fraud.	Consumers are interested in the origin of food, traceability, and authenticity. Premium high-quality food products matched to their origin and brand	[14–18]
Emerging trends and sustainable food choices	Access to quality traditional foods with cultural and dietary significance. Consumption of industrialized, processed foods.	Traditional foods are promoted through 'food tourism', growing interest related to production, consumption, identities, local food, and communities	[19–21]

In this article, the themes correspond to the sections that are discussed. Section 2 addresses the issue of food security and sovereignty in the region. Section 3 highlights the relevance of efficiency in processing raw food materials into value-added products. Section 4 considers some local and global implications while Section 5 considers sustainability through digital solutions, followed by emerging trends and sustainable food choices in Section 6. Finally, Section 7 concludes.

2. Food Security and Sovereignty in the Nordic-Arctic Region

The Arctic region acts as a carbon sink to the globe. The region is characterized by a vast number of peatlands within the northern permafrost region, which is currently undergoing a largely irreversible thaw due to global warming [10,22,23].

The Nordic-Arctic region, as shown in Figure 1, includes the area in deep green: the Faroe Islands, Iceland, and Greenland, as well as the northernmost regions of Finland, Norway, and Sweden.

As the ice melts, there is a change in the flora and fauna; henceforth, the ways of life of people in the region are at risk. The emphasis on the challenges of climate change accountability and climate change mitigation strategies should focus more on institutional forces and actors involved in the Nordic-Arctic communities [24]

Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meet their dietary needs and food preferences for an active and healthy life [25]. The preference for a particular food in a community is related to its culture and heritage. Briefly, food security is ensuring access to healthy food for the community. This was said to be possible by the existence of a sustainable food system that provides adequate and sufficient food for everyone equally [26]. The four dimensions of food security, i.e., availability, accessibility, stability, and utilization, are affected by climate change, and even though the region is known to be rich in resources, such changes impose a major challenge in their utilization [27].

In other words, the existence of adequate food security is reliant on physical, social, and economic access to food sufficiently and safely [28]. It is essential to make sure that a community is well-prepared for any upcoming threats that may affect food security in order to achieve resilience [29]. The food system needs to be well-built to withstand difficult situations and be able to provide food even during those times [30]. According to the Food and Agriculture Organization (FAO), resilience is built in three capacities: adaptive (coping strategies and risk management), absorptive (use of assets, attitudes, livelihood diversification, and human capital), and transformative (governance mechanisms, policies/regulations, infrastructure, community networks, and formal safety nets) [31]. There are interrelated factors that may have a significant impact on food security, such as climate

change, which are interlinked with industrial and socioeconomic factors [32,33]. The impacts of climate change on marine and terrestrial ecological dynamics threaten the access to traditional foods in the Nordic-Arctic region [7]. By extension, both humans and animals in the region are affected by the impacts of climate change and pollution [34].

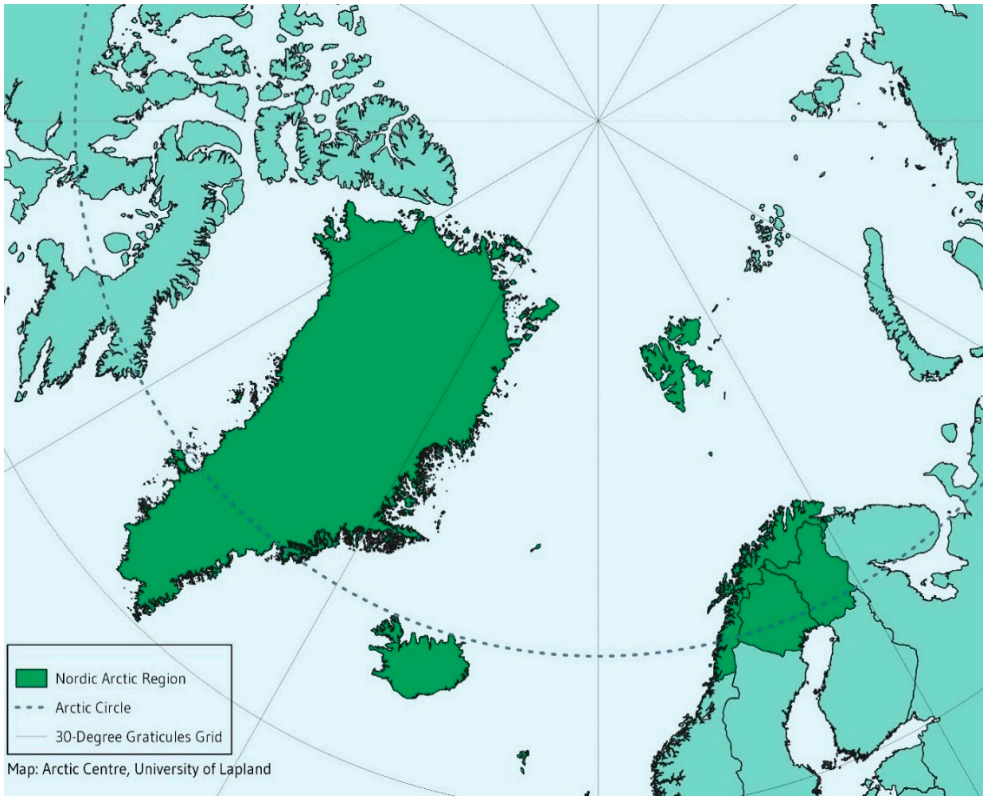

Figure 1. The Nordic-Arctic region (Map: Arctic Centre, University of Lapland, Finland).

In addition to pollution from human activities, such concerns could endanger the security of the food supply chain in a local food system [35]. The people living closer to nature were found to be more vulnerable than others due to climate change; a large threat is encountered by reindeer herders in the Nordic-Arctic region [36,37]. However, it has been argued that with food sovereignty, which describes how much power and control is possessed over the food system, the people should have the right to decide how the food is produced, distributed, and consumed by acknowledging that their culture and values might be more appropriate for the Nordic-Arctic region [38,39].

Reindeer herding is an essential part of many Indigenous peoples of the Arctic. The reason it is necessary is because it allows the herders to be part of the food chain such that food security will be ensured, in addition to preserving the rights and ways of life of Indigenous peoples. In this scenario, food security will be strongly connected to food sovereignty, as the involvement of herders in the food value chain and the export market would ensure sufficient access to reindeer meat [40]. It was observed that in order for the Indigenous peoples to be able to adapt to harsh conditions of the Arctic, they need sufficient access to their traditional foods, which includes reindeer, fish, and wild plants. Reindeer meat is an inseparable part of the diet in Indigenous communities of the Arctic, and it contains what is necessary to maintain a healthy diet and prevent cardiovascular and respiratory diseases [41].

Economic sovereignty is also a major factor in guaranteeing strong food sovereignty for local communities, as they would be able to make decisions on issues concerning the use, sale, and consumption of their local food, which would also greatly improve food security in the region [40]. Some short-term measures were suggested to improve food sovereignty for

local people. Examples of such measures include economic and legal consulting services for nomadic and semi-nomadic reindeer herders to support businesses and increasing reindeer herders' access to reasonably priced fuel and basic food products near the settlements and trading spots [40]. In addition to the short-term measures, some long-term measures, such as monitoring the consumption of traditional food of the Indigenous peoples in the Arctic in relation to health and social welfare, were also suggested by the authors [40]. By promoting food sovereignty through the active participation of Indigenous people and their knowledge ensures responsible consumption and production. This responsibility will help to guarantee a biocultural heritage that will promote social, economic, and environmental sustainability in the region.

Generally, long distances, sparsely populated areas, and natural resources, such as forests, fish, minerals, oil and gas, and Arctic conditions, characterize the Nordic-Arctic region [35]. When people travel from one place to another, they take with them certain images, including tactile sensations, from local foods. For example, in Finnish Lapland, the images and passion are strongly associated with reindeer and fells, coldness, long winters, a bright summer, northern light, and cold waters of rivers and lakes. Local people have the right to their culture and to produce their own food in their own cultural way. Tourists would like to experience authenticity without harming the original people and their culture. These unique phenomena can be supported by the economic, cultural, and historical features of the Nordic-Arctic region. It is important to make food available to everyone either through domestic production or importation. They should also have sufficient resources or purchasing power to obtain nutritious food as part of their diet. These must be considered in legal, political, economic, social, and cultural aspects with considerations to traditional values. Individuals, households, and the whole population should have food security in all circumstances, regardless of the environmental conditions. Considering the importance of the community and the traditional sharing culture, food should also be available through adequate diet, clean water, sanitation, and health care to achieve a sufficient state of nutritional well-being where all physiological needs are met.

There are many things that can pose a threat to tradition, livelihood, and continuity of biocultural heritage that are related to natural resources. For example, not only is tourism vital to the economy of locals, but it also can contribute to changing and distorting the local culture, as well as the loss in traditional knowledge, local access and use of foods, and damage to the health of soils. Other threats may include climate change and general weather instability, which cause problems to farming, food intake, and reindeer grazing, including the growth of berries and mushrooms. Land use, mines, pollution, as well as shipping routes, can affect the environment, availability, and safety of foods. COVID-19 is another challenge, especially with seasonal workers and the movement of people, that can disrupt food supply. Political solutions at the state level can also affect the level of support or threats toward food security and sovereignty.

Indigenous peoples have supported food security since the Middle Ages and, from the 16th century, they have fished, hunted, cultivated land, and collected natural products and wild berries as a way to obtain food and interact with each other. They also traded with residents from different regions [35]. This heritage should be supported and respected, as its healthy and clean processes are good for the well-being of the locals, and the local foods are free from additives with less packaging and transport, which are often common with imported foods. They can also produce, process, and sell these foods to locals and tourists thereby maintaining the biocultural images to promote gastro-terrestrial tourism through their unique product brands. Digitalization will also bring added value to products, as well as reduce storage and transport costs and packaging and waste, thereby improving sustainability in a food system [42].

From a global perspective, the sustainability of the food system in the Nordic-Arctic region is interrelated to current challenges and trends, which are summarized in Figure 2.

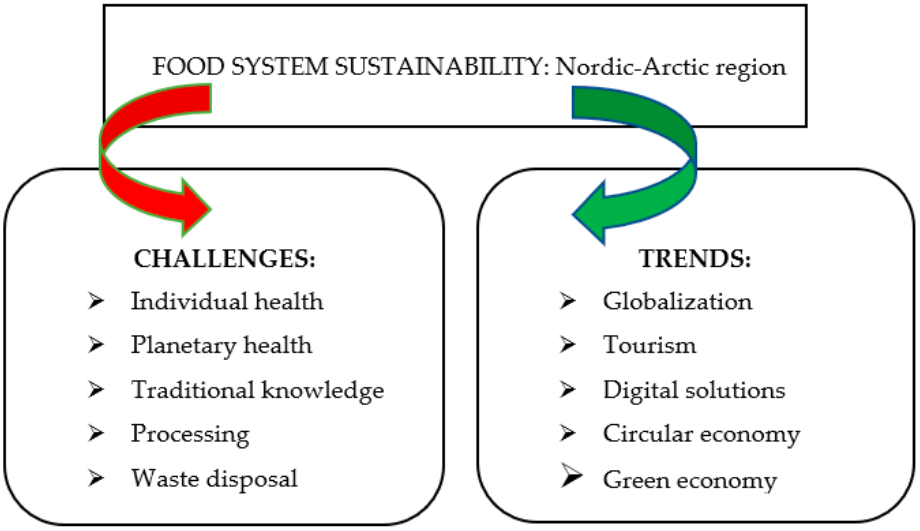

Figure 2. Interrelated challenges and trends that can affect the food system sustainability in the Norid-Arctic region.

3. Efficiency in Processing and Value Chain (Food-Energy-Water Nexus)

The increasing dependence of Indigenous peoples of the North on the global economy have reduced their resilience and ability to adapt [43]. Many people in the region depend more on imported foods that are frequently impacted by world food price fluctuations, and it is crucial to start focusing on the food sovereignty of the regions [44], as described in the previous section. However, to improve food sovereignty and regional resilience, we should also pay attention to the environmental impacts of our food choices. In preserving biocultural heritage, the impacts of the agri-food sector to greenhouse gas emission are also crucial. According to the United Nations Food and Agriculture Organization, the food sectors' contributions to the global greenhouse gas (GHG) emissions was 20% in 2011 [45]. In order to achieve sustainability, reduce waste, and ensure the efficient use of resources, changes are required in food supply chains, starting with local suppliers and processors [46]. Food production led to 32% terrestrial acidification and 78% eutrophication. Therefore, the impact of food is significant to the health of the ecosystem, biodiversity, and resilience, including planetary health [47,48]. Global warming is threatening the life of human beings and animals worldwide, especially in the North, where people face difficulties with melting sea ice, thawing permafrost, and unpredictable weather conditions [49]. Naturally, all these factors affect the food security of the regions' inhabitants who depend on traditional, fresh, and healthy foods from land and sea. An efficient means of processing will ensure less waste of natural resources; however, it is equally important for sustainably to preserve biocultural heritage.

The produced foods from available resources need to be safe and of good quality in order to support human health. The processing operations that add value to these foods need to be efficient with considerations to the overall food-energy-water nexus. Water is important in the processing of foods; however, access to clean water is a major concern nowadays. In the Nordic-Arctic region, climate change impacts the availability of water because it results in melting glaciers, decreasing seasonal rates of precipitation, and drying lakes and rivers existing in permafrost grounds [50]. The quality of water is affected by human activities because of resulting pollutants, and the demand for water is expected to increase dramatically in order to meet the increased demand in food and energy [51]. In addition to affecting food security, climate change and land-water usage also affect water security [51]. This affects both animals and humans whether they are located in remote areas or in areas with a developed infrastructure. Adapting to the change in climate requires an increase in producing fresh water in order to avoid a situation where the demand exceeds the availability [52]. Humans in the Arctic are reliant on surface water

for drinking, cooking, and industrial purposes. Indigenous people use the sea ice and waterways for transportation in order to access their traditional foods [52].

Access to traditional food is important to Indigenous people, their culture, and identity as well as to food security. Therefore, it is necessary to focus on the cultural food preferences and ensure good accessibility to it [53]. Access to traditional food in the Barents region is quite limited due to the impacts of climate change, and Indigenous people's resilience and ability to adapt to hard situations has been compromised because of their increasing dependence on the global economy as the impacts of climate change limit access to traditional foods, which have served as a safety net against food insecurity.

4. From Local Taste to the Global Community

When food and agriculture are considered in relation to individual choice, self-sufficiency, and sovereignty, each region has its own unique approach for the best solutions, either individually, locally, regionally, or nationally. For instance, in the Arctic region, these choices are related to climate change, wildlife management, economic vulnerability, pollution, and cultural security. It is important to consider what prevents households from receiving traditional food. Distribution on an irregular basis or at different levels can affect their health, and affordability can also affect access to traditional foods [34]. As mentioned in the previous section, an efficient processing method that can diversify traditional foods in the local communities will help to create niche products that can reach the global market.

For example, in Saija village (Finnish Lapland) close to the Russian border, there are opportunities for livestock production, reindeer breeding, reindeer chips, cattle and beef production, mushroom cultivation (Matsutake mushrooms), and greenhouse cultivation, such as fruits and vegetables, to promote bioeconomy. Sodankylä (Finnish Lapland) also significantly increased its production of local berries, vegetables, and meat in the area with emphasis on the green economy in the village [42]. The use of custom garden crops also attracts tourists and visitors, as well as landscaped gardens, green care, and healing gardens [54]. In Kittilä (Finnish Lapland), there are areas, such as the Levi Nature Tourism Centre, for the cultivation of wild herbs, mushrooms, and berries [55]. Milk and dairy products from Lapland's cow (Finncattle) are good-tasting and exotic. The milk can be made into good-tasting bread cheese; the soft bread cheese can be slightly grilled, giving it a beautiful surface [56]. It can be eaten with coffee and berries, such as cloudberries, or made into Arctic ice cream [35]. Other self-sufficient traditional dishes have traditionally been obtained from reindeer meat, such as chips sliced from frozen reindeer or sautéed reindeer, often served with mashed potatoes, and fresh lingonberries or lingonberry jam. Reindeer meat may also be processed into canned meat and other products, such as fillets, cold cuts, jerky, minced meat, or sausage [42]. In addition, meat from sheep, pigs, and game, as well as animal blood, has been used as food; different fish species and seafood are also important as cultural foods. The culture of fishing, hunting, and collecting in groups also increases communality and may improve mental health. People in Lapland have also grown potatoes, such as the Lapland's almond potatoes "puikula", and barley, which survives in the harsh conditions of the North. For example, barley can be baked into bread or brewed as beer, such as Lapland's Gold Arctic Malt. Mushrooms can also be picked freely in the forests, as it is every person's right. Various natural herbs and berries from forests, such as blueberry, lingonberry, cloudberry, and cranberry, are very important as appetizers, jams, drinks, or desserts [35]. The Arctic region is yet to meet its full potential to satisfy local food needs and maximize its export potential [57]. While preserving biocultural heritage, the emphasis for the region should be on premium quality rather than quantity when local tastes are introduced to the global community.

Smart digitalization through the 'Internet of Things' can make these traditional foods, producers, and processors meet the consumers near and far away in an online store or a virtual tourists' restaurant. Local or seasonal workers can gain more information and learn about raw food products, storage solutions, and management to improve efficiency, such as reindeer slaughter [37]. To develop new products of their own, consumers can obtain

more information about product nutritional content and express directly tailored wishes to the producer. In this case, a comprehensive sustainable future in accordance with the principles of bioeconomy and economic, social, and environmental dimensions can also be implemented alongside a circular economy [58]. The locals must be brave and engage in innovation to regenerate and make new decisions. At the same time, technology can attract consumers' interest in local products. Generally, consumers are interested in the multipurpose framework that raises the awareness between the importance of food, diet, nutrition, and health. Tourists are expected to buy more of these local products as delicacies or gifts [42].

However, there are concerns that a rapid increase in the tourism footprint will have devastating impacts on sustainability of Nordic-Arctic communities and ecosystems. Nature-based tourism in parts of the Arctic. Scandinavia, Iceland, and Faroe Islands have experienced unprecedented growth in the number of tourists in recent years [59]. As new parts of the Arctic are being opened to tourism by melting sea ice, new airports are being built to support the continuing boom in tourism. For instance, the total annual GHG load caused by tourism to Iceland has tripled in just five years, rising from approximately 600,000 tons CO_2-eq in 2010 to 1,800,000 tons in 2015 [60]. Cumulatively, this means 6.4 million tons of CO_2-eq have been emitted due to tourism in Iceland during this period [60].

5. Sustainability through Digital Solutions

As discussed in Section 4, awareness on sustainability will be important for gastro-terrestrial food tourism. A recent conference by the Food and Agriculture Organization of the United Nations in 2020 regarding the digitalization of food and agriculture states that digital technologies are rapidly transforming how people, businesses, and governments work and already generate significant benefits by reducing the costs of information, transactions, and supervision. Many countries have, or are in the process of developing, digital agricultural strategies to design, develop, and apply innovative ways to use digital technologies. Such strategies promote digital infrastructure improvements and the development and application of digital tools in agriculture and rural areas and attempt to bridge the gap of the 'digital divide' between economies, sectors, or individuals with differing abilities to adopt new technologies [61].

Climate related phenomena can be observed globally with various movements and actions, e.g., 'Fridays for Future', circular economies, plant-based diets, and smart cities with emphasis on making the world more sustainable, so that we can meet our production and consumption needs without compromising the ability of future generations to meet their own needs, not only environmentally but also in terms of social equality and economic development [62]. Many businesses and start-ups are already applying digital technologies to farming for various reasons, whether to improve the yield, generate less waste or use only the necessary resources. The origin of food, traceability, and the need to support local companies to boost local economy are gaining popularity [14]; they are advanced by digital solutions. The message to consumers on the authenticity of premium quality products from this region can be promoted to build a niche brand with a good appeal [14,15,18].

Overall, they improve the sustainability of farming practices. For example, drones or satellites make it possible to assess the yield patterns for vast amounts of lands through high-resolution images. Farmers can track the health of their soil through the help of trace genomics and other possibilities at their disposal for monitoring algorithms and machine learning [63].

Digital solutions offer a vast range of ways to improve the production of food within the food system in order to increase yield and conserve the resources at our disposal, thereby ensuring sustainability [64]. An important way to build on sustainability is through the accumulated traditional knowledge from the past. 'Arbediehtu', as practiced in the Swedish Saami culture, can be combined with scientific knowledge [9].

However, others have raised the question of ethics in this new way of farming, processing, and in protecting biocultural heritage. Not all people working in the farming

sector have access to the same resources nor can they use them in the same way. Therefore, "smart farming" has a massive potential to disadvantage the smaller stakeholders that might not have access to the datasets. This puts the smaller players and farmers in the food sector at a disadvantaged position, and it favors the multinational agribusinesses. Businesses such as the California-based 'On Farm' have developed a software that makes this information available for the smaller players of the food industry, giving them access to artificial intelligence (AI), big data, and other analytics, which most likely will gain traction and thus make a first step toward combating the social inequality origination from the difference in access. This sharing of information is vital in order to proceed in the direction of feeding the growing world population without harming the world by putting pressure on the resources at our disposal and the fragile societal support systems. In order to achieve a sustainable food system by aiding the collection and analysis of big datasets, we gain a better understanding of the complex processes [63,65]. Here, the necessities for the digital technologies are changing the ways in which the food system players interact with each other by utilizing social media, emails, or websites, all of which make it easier for the consumer and the producer to interact [65]. These developments have helped communities manage the continuing challenges of the COVID-19 pandemic, making it possible for people to shop for what they need from the grocery stores using social media from the safety of their houses.

As a result of the ongoing COVID-19 pandemic, almost all the aspects of human life have changed in order to cope with it. Nowadays, humans have become more dependent on digital technology in order to maintain contact with their loved ones or work from home; thus, the pandemic "is expected to turbo-charge the digitalization trend in the food industry" [65,66]. However, this is not possible for everyone and thus poses the danger of a digital divide, enhancing social inequalities. For these digital innovations to be implemented in a useful way, it requires major players, such as the governments, businesses, and farmers, to interact successfully with each other so affordability remains available for everyone, thus improving the quality of life in the future for the people living in remote places, which usually are disadvantaged [66]. The digital divide has caused an increasing gap between rural and urban areas. People move from rural areas into cities for several reasons, many of which have resulted in the loss in population in rural areas. Many now rely on "inclusive digitalization" to overcome these problems and shrink social gaps. However, there is an interest to move from densely populated urban cities to rural areas since such sparsely populated rural areas have recorded lower cases of COVID-19.

Another important aspect is the need to combat unnecessary food waste and encourage the use of side streams as part of the circular economy. It is possible to resort to recently developed digital solutions, such as the "Internet of Things" (IoT), which can enhance the efficiency of cold chains and thus extend the shelf life of many products, saving energy and lowering the emissions of greenhouse gas [63]. In the Arctic, it is especially important for the people who live there to rely on the climate and ecosystem. The agriculture and food system make it particularly important that digital innovations are implemented in order to work against the effects of climate change [24]. According to the Arctic Council, the Arctic region is a valued food production region with 10,000 years of history, but it still has not reached its full potential [67]. With the help of the Arctic Council's Sustainable Development Working Group, Arctic Food Innovation Cluster was drawn up to aid the connection and identification of important stakeholders [67]. The cluster will focus on climate change, commercial resources, infrastructure, resources, industry policy, food traditions, and organization of food chains and market conditions, which includes local, national, and international markets [66]. The emphasis will be to use resources in areas of production in which the region has a comparative advantage. Henceforth, it identifies potential pathways for Arctic food production and distribution that will lead to more sustainable food systems in the Arctic. Similar to the rest of the world, food manufacturing institutions in the Arctic, with the help of digital technologies, can improve the quality of food products by collecting data of the biotic and abiotic factors with sensors aimed at

reducing packaging and food waste by using smart packaging devices and block chain technologies, which enable the tracing of the food with the prerequisite of collecting certain datasets in a structured and digitalized way [42,68]. The adoption of digital technologies in the Arctic are expected to make the markets more open to foods that are produced locally in the surrounding communities [42] and thus have a major impact on social, environmental, and economic sustainability. In 2014, the Ministry of Agriculture and Forestry drafted a climate program for Finnish agriculture called "Steps towards Climate Friendly Food" to better the impact of the food system in Finland regarding its sustainability. This program entails several measures to facilitate the adaptation of food production and consumption to climate change and/or to mitigate the change with emphasis on profitable production and responsible consumption [69].

6. Emerging Trends and Sustainable Food Choices

The food sector can play a significant role in global greenhouse gas emissions, acidification, climate change, and eutrophication [70]. Therefore, it is necessary to rethink our food choices as suggested in a recent report on the emerging megatrends of the Nordic-Baltic regions on how human beings can improve their health and the environment by more sustainable food choices. The report, published by the Nordic Council of Ministers, identified eight megatrends of the Nordic-Baltic food systems that are affected by our actions and identified the consequences for the future [65].

The report includes trends that are related to the redesign of food systems, the polarization of societies, technological growth, digitalization, growing anxiety, and lifestyle changes.

Global threats, such as climate change, pandemics, and biodiversity loss, are worrisome to our personal health and the environment in the long term. Food tourism has been linked to the past as well as the geographical present of the circumpolar North [71]. Personal choices, such as healthier fast-food delicacies, imported foods, and healthier and more nutritious (high-quality or premium) foods, will help our personal health and the environment [71]. Our food choices are increasingly affected by advertizements and social media. Digitalization could help small food producers reach their consumers and influence their choices [65]. For example, according to Deloitte's study, an increasing number of millennials prefer plant-based products over animal products, so they are able to protect the environment or the planet's health [72]. By promoting new kinds of human-nature relations and lifestyles will help us to breathe cleaner air, allow us to be part of nature again, and feel rooted in it. As stated in the report, recreational activities, such as fishing and foraging, will become more popular in the future. It is important that individuals' choices affect the supply markets; if people are more interested in consuming healthy and sustainable options, this will eventually affect the whole food sector and society [65].

According to the Nordic Council of Ministers report, one potential outcome of the Nordic-Baltic megatrends is to ensure that regional food systems are in line with the United Nations sustainable development goals. Thus, we must ensure that food systems are sustainable and stay within the environmental boundaries of the planet [73]. Rather than continuing business as usual, we should change our linear models to circular production and consumptions models, which can lead to more efficient use of energy and resources, longer product lifespans, and increased consumption responsibility [62].

The packaging of foods and other products within the food system should be revised for sustainability. Avoiding the single-use items of plastics is vital to reduce the already existing environmental problems of pollution. Companies, such as Tetra Pak, have started producing more sustainable packaging, and more research studies are on-going [74]. Therefore, in addition to researching these problems, it is crucial to act toward a healthier and more sustainable future. The Northern parts of Finland, Norway, Sweden, Faroe Island, Iceland, and Greenland can share experiences that are related to these trends and best practices on mitigating the challenges. Best practices on production and consumption models that ensure a circular economy will be important to enhance sustainability in the region.

7. Concluding Remarks

Climate change has a major effect on food security, such as availability, accessibility, stability, and utilization, which impose a challenge in utilizing natural resources in the region. Food underpins cultures, economies, and our relationship with the natural world. The food system affects every aspect of human existence, and it has also been shown to be crucial to achieving the United Nations sustainable development goals [75]. Access to traditional food is of utmost importance to Indigenous people, both for cultural identity and food security, but due to climate change, the access to such food has been limited. Climate change and human-made activities also affect water availability, and it is essential to make sure that the available water meets the food and energy demands to avoid a situation where the demand exceeds the available water. In order to ensure food security, Indigenous peoples must have the right to be in control and to decide how their food is produced, distributed, and consumed by maintaining their culture and values. For the Indigenous people to be resilient and adapt to harsh conditions, sufficient access to the traditional foods, such as reindeer, fish, wild plants, etc., is necessary.

Economic sovereignty ensures good food sovereignty for local communities, as they would be able to make decisions on issues concerning the use, sale, and consumption of their local food, which would also ensure food security in the region. It is vital that not only individuals but also states support healthy diets and local food systems, with better consideration to the environment instead of economic growth. There is a need for more awareness on this topic since the food sector is a significant source of GHG gas and other pollutants with impacts on the health of humans and environment. Digital solutions are important tools to effect positive changes in the purchasing behavior and food choices of the millennials and future generations. Therefore, it is important to shift our processing methods toward sustainable solutions that focus on long-term issues to safeguard biocultural heritage in the Nordic-Arctic region. This review presents some limitations on ways to preserve biocultural heritage in the Nordic-Arctic region. It will be important to address food production systems that can better restore community connections to the land and traditional knowledge associated with food production that can be passed on to the future generations. Other limitations presented in this review are that the challenges of each country were not considered. The Canadian, Alaskan, and Russian Arctic regions were excluded. There are fragmentary publications on the food system in the Nordic-Arctic. In order to develop strategies that will engage the food system challenges in the Nordic-Arctic region, we should conduct qualitative interviews with industries, processors, and different segments of the population in each country. These would be important toward achieving quality, consumer trust, and sustainability.

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