

## **Price disparities, food accessibility and settlements connectivity in Sakha Republic (Yakutia)**

### **Introduction**

In this paper, we analyze relationships between the geographical features of the Sakha Republic (Yakutia) and the accessibility and availability of modern and traditional food. We discuss the results of field research carried out within the RISE project. RISE (Climate change Resilience of Indigenous Socio-Ecological systems) is a joint international project that aims at filling this knowledge gap by understanding the socioeconomic and nutritional contributions of traditional food systems and the risks from future climate and environmental changes to promote sustainable development and adaptation.

**The purpose of the study** is to analyze the accessibility and availability of local and imported foodstuff to residents of the Sakha Republic (Yakutia) depending on the transport accessibility of settlements.

**Objectives of the study:** to characterize the local diet (the share of local and imported foodstuff); to study\explain disparities in food prices; to assess the accessibility and availability of local and imported food, depending on the isolation and transport accessibility of settlements.

### **Research methods.**

1. The features of the local diet were determined based on a socio-economic survey of the rural population of the Sakha Republic (Yakutia) which was conducted in 2021-2022 (1 quarter) within the framework of the RISE project. The questionnaire consisting of 99 questions includes parts about the traditional cuisine of peoples of Yakutia, consumption of modern and imported products, the prevalence of local food species, and income of the respondents.

2. The accessibility of foodstuff was studied through monitoring. Data collection was carried out using a special form which includes a list of 45 kinds of foodstuff. 30 kinds of these products are included in a list of products prices which are monitored by the State Committee for Price Policy of the Sakha Republic (Yakutia). Therefore, we have additional data on price disparities in the food market. 15 more types of products were added as the most popular modern lifestyle products in Yakutia. In addition, the availability (range) of food and drinks was monitored to collect data on the physical availability of food depending on the transport accessibility of the settlement.

3. To study prices and accessibility of food we used an updated spatial database of settlements of the Sakha Republic (Yakutia). This database is a matrix of complex connectivity of settlements, considering seasonal isolation, and ice and ferry crossings. The evaluation was carried out based on correlation-regression analysis.

According to the World Food Summit (1996), food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their

dietary needs and food preferences for an active and healthy life. Existing international statistics show a strong connection between food availability and diet and life expectancy. According to the Russian Federation Food Security Doctrine, physical food availability is the level of commodity distribution infrastructure development when the population in every locality of the country can purchase basic foodstuffs or catering can be arranged in quantities and assortments no less than the established balanced food consumption rates. [Gavrilyeva & Stepanova, 2021].

Geographically, the Sakha Republic (Yakutia) is a complex vast territory crisscrossed by natural barriers such as rivers (Lena, Vilyui, Aldan, etc.) The Arctic tundra is the largest barrier that separates settlements in the absence of paved roads. The Arctic is a territory of temporary winter routes and extreme fragmentation of the populated space. Significant natural and climatic differences within the region also lead to differences in local transport schemes and schedules, for example, between Eastern and Central Yakutia. November is a "dead season" for Yakutsk agglomeration due to the absence of a bridge across the Lena River. Closure of waterways and unavailability of ice crossings practically cut transport links with other regions of the country. At the same time, for the Arctic isolated settlements, this is the time to open winter roads and resume communication with the outside world.

The Sakha Republic (Yakutia), like other northern regions of Russia, due to harsh climate is not a self-sufficient region. Most of the local agricultural products cannot withstand competition from imported ones both from the main agricultural regions of Russia and from abroad. For example, the share of local production is 24% of total meat consumption in Yakutia, dairy products - 59%, potatoes - 69%, and other vegetables - 40%. In addition, the northern regions of the Russian Federation have logistical problems related to hard-to-reach settlements, where food, fuel, energy resources, and other goods are delivered within the framework of the "northern delivery" operating since the Soviet era. The large spread of settlements and low population density increase the cost of delivering small consignments of food by entrepreneurs. The low density of retail outlets is a reason why a significant part of the products is purchased in informal grocery markets. Many intermediaries between the food manufacturer and its consumer, and long difficult transportation to the retailer also increase in food prices.

A regional specific feature of Yakutia as for consumption of food is discrepancy thereof with the reference consumption rates that meet modern requirements for a healthy diet, approved by the federal government. The region shows higher consumption of bread, meat, and sugar, and lower consumption of vegetables, milk, eggs, and vegetable oil compared to the regions of Russia's Far East and Russia as a whole. This is a consequence of both the sustainability of traditional food patterns and the underdeveloped healthy lifestyle skills; furthermore, imported food can be inaccessible for residents of isolated settlements both physically and economically [Gavrilyeva &

Parilova, 2022].

The data collected within the RISE project was compared with the matrix of complex connectivity of settlements of the Sakha Republic (Yakutia) considering seasonal isolation, ice and ferry crossings through the waterway. It covers 410 municipalities of Yakutia taking into account the restrictions in the winter and summer periods, based on the methodology presented by N.G. Kolesnikov [2017]. Initial conditions:

- to determine distances between settlements we used the shortest land distances along public roads including winter roads for the corresponding matrix;

- 500 km is taken as the maximum possible distance between 2 locations, as a restriction on the delivery of goods to local markets;

- we ignored the limitation of 500 km for the Yakutsk agglomeration due to its importance in the region's inventory system;

- schedules of ferry crossings, ice crossings, and winter roads were provided by the Ministry of Transport and Roads of the Republic of Sakha (Yakutia) [Gavrilyeva & Bochkarev, 2021].

Correlation-regression analysis was used to assess the price and physical availability of food.

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