Sustainable Milk Production as a Food Security Factor in the Republic of Sakha (Yakutia)

L I Eliseeva\textsuperscript{1}, K M Stepanov\textsuperscript{1}

\textsuperscript{1}Arctic State Agrotechnological University, Sergelyakhskoye sh., 3, Yakutsk, 677007, Republic of Sakha (Yakutia), Russia

E-mail: eliseeva401@mail.ru

Abstract. This article presents the assessment results for the food safety of the republic. To assess the food safety of the republic for milk products, we studied the consumption of food per capita.

1. Introduction
Cattle breeding in the Republic of Sakha (Yakutia) is a traditional and the most significant sector of agriculture. Its state largely determines the agricultural economy. One of the key components of dairy farming is milk production. It must comply with sanitary regulations and reprocessors’ requirements. Providing residents with milk and milk products produced in the region is a key goal of the Republic’s agricultural sector.

During the period of market economy development, the bovine stock in the Republic decreased by 45%, including the 42% decrease in cows. Milk production in 2015 amounted to 171.4 thousand tons as compared to 267.4 thousand tons in 1990 (a 36% reduction). The zootechnic researchers and practitioners in the republic are trying to improve the productivity of the existing breeds. The market development requires an academic basis for milk and dairy product production, as well as organizational and economic actions targeting sustainable, rational, and efficient development of dairy farming.

2. Research relevance
The harsh climate and natural conditions of Yakutia make the research of the current state of animal farming, product safety in the republic, as well as the development of resource-saving production technologies for Yakutian milk products through the complete utilization of milk and modern milk processing technology improvements extremely important for both researchers and practitioners.

3. Research Methods
To assess the food safety of the republic for milk products, we studied the consumption of food per capita and compared the actual per capita consumption with the standard values.

The comparison of the actual per capita consumption of specific products with the standard values helps determine the satisfaction levels for the popular demand in these products (Table 1).
Table 1. The dynamics of the satisfaction coefficient for dairy products in Yakutia.

| Milk and dairy products | Year | 2015  | 2016  | 2017  | 2018  | 2019  |
|-------------------------|------|------|------|------|------|------|
| Cities                  |      | 0.859| 0.859| 0.848| 0.846| 0.844|
| Countryside             |      | 0.893| 0.969| 0.922| 0.918| 0.926|
| Total                   |      | 0.590| 0.925| 0.918| 0.908| 0.848|

As we can see, the consumption of milk and dairy products in the republic throughout the period in question did not reach the justified standards.

The Republic of Sakha (Yakutia) holds the second position among the regions of the Far Eastern Federal District (after the Primorye region) in terms of agricultural production. Farms of all categories produced goods worth 16.9 billion rubles, which is 1.3% higher compared to the previous year's values. The actions taken resulted in the deceleration of the further decrease of bovine livestock, as well as horses and deer. In 2019, the aggregate figures for all categories of farms were as follows 185.4 thousand bovines, including 73.4 thousand cows, 27.4 thousand pigs, 176.8 thousand horses, including 86.8 thousand mares; 156 thousand deer, and 918.4 thousand fowls.

The highest dairy stock was found in Central Yakutia (56.7 thousand animals), the lowest - in the industrial zone of Southern Yakutia (370 animals). Thus, the highest gross milk yield was observed in the uluses of Central Yakutia, and the lowest - in Southern Yakutia.

Currently, the average milk yield per 1 forage-fed cow in the republic amounts to 1950 kg (in 1990, it was 1870 kg). Relatively high milk yield per one cow was observed in the western industrial zone (1992 kg), where they keep the most productive Kholmogory breed (Olekminsky and Lensky uluses). In the republic, 66% of the produced milk is sold and 34% are used as food by the residents themselves. The agricultural produce output is a key indicator of food safety (Table 2).

Table 2. The comparative analysis of milk production dynamics in the republic.

| Indicators                                      | Year | 2015  | 2016  | 2017  | 2018  | 2019  |
|------------------------------------------------|------|------|------|------|------|------|
| Milk production in Russia, million tons         |      | 19.8 | 20.3 | 21.0 | 21.5 | 22.1 |
| Growth rate, %                                  |      | 98   | 102.5| 103.4| 102.4| 102.8|
| Milk production in Yakutia, tons                |      | 164572| 164657| 162921| 161292| 159679|
| Growth rate, %                                  |      | 97.7 | 99.9 | 98.9 | 99.0 | 98.9 |
| Cow stock in Russia, million animals            |      | 8.12 | 7.97 | 7.95 | 7.94 | 7.90 |
| Growth rate, %                                  |      | 99.0 | 97.8 | 99.7 | 99.9 | 99.5 |
| Cow stock in Yakutia, animals                   |      | 75.302| 75.002| 74.550| 74.177| 73.435|
| Growth rate, %                                  |      | 97.5 | 99.6 | 99.4 | 99.5 | 98.9 |
| Milk yield per 1 cow in Russia, kg              |      | 5140 | 5370 | 5838 | 5945 | 5790 |
| Growth rate, %                                  |      | 106.2| 104.5| 108.7| 101.8| 97.4 |
| Milk yield per 1 cow in Yakutia, kg             |      | 1900 | 1913 | 1930.5| 1946 | 1950 |
| Growth rate, %                                  |      | 101.0| 100.7| 100.9| 100.8| 100.2|

Over recent years, the republic sees a decrease in milk production, both aggregate and per capita. The productivity of cows is a key factor influencing the gross milk yield. The regions have some capacities to increase it. To assess the impacts on the yearly average productivity of cows, we performed a correlation-regression analysis that helped identify the most important factors: calf crop per 100 cows, feed consumption per one cow, energy security per 100 ha of farmland/ha.

The republic is introducing high-efficiency milk farming technologies, which will help increase the productivity of the animals and the gross milk yield. A total of 4% of the livestock are kept loose and
milked in modern lactoria. Some livestock buildings in Tattinsky ulus were constructed, reconstructed, and upgraded.

There is a targeted program for the Development of Dairy Farming in the Republic of Sakha (Yakutia) in 2017-2021 that aims to improve the efficiency of agricultural companies. Governmental support shall stimulate agricultural companies in the republic to increase their livestock, upgrade their facilities, and employ modern technologies for feeding and management.

The further development of the agricultural sector in the republic is impossible without the production of new knowledge, the promotion of scientific advances, their testing and application in production practices, and the participation of the academic community in the development and review of regional long-term targeted programs.

4. Conclusions
To solve the problems associated with selling agricultural produce on farmers’ markets, it is necessary to arrange high-tech warehouses to store agricultural products.

This can be funded through the involvement of all production companies, taking into account their efficiency and profitability on a leasing basis.

The warehouses shall improve the profitability and durability of farms and processors.

Simultaneously, we need to increase the quality and quantity of raw materials. Standardization is a method of managing the quality and quantity of milk. Increasing the prices according to the milk grade improves the material interest of businesses and production workers in the production of high-quality goods.

5. References
[1] Abramov A F 2018 Nutritional and biological value of meat, offal of Yakut cattle (Novosibirsk ANSIBAK) 113
[2] Abramov A F 2000 Ecological and economic foundations of feed production and rational use of pastures in Yakutia (Novosibirsk: publishing house: SO RAAS) 194-199
[3] Abramov A F 2019 Yakut cattle - heritage of mankind: monograph (Yakutsk: Octahedron) 100 p ISBN978-5-9500263-1-7
[4] Eliseeva L I 2013 Efficiency of milk production in Yakutia Issues of education and science in the XXI century: collection of articles. scientific. tr. Part 1 (Tambov) 79-83
[5] Eliseeva L I 2014 Economic efficiency of cow breeds - the basis for increasing milk production and rational use of feed in the Republic of Sakha (Yakutia) International Agricultural Journal 5 43-44
[6] Eliseeva L I 2016 Analysis of the breeding of replacement heifers by breed Sodruzhestvo 4 99-106
[7] Eliseeva L I 2016 Milk productivity of cows of different breeds, chemical composition and technological properties of milk in the conditions of Yakutia: monograph (Ulan-Ude: Publishing house of BSKhA im. V.R. Filippova) 212 p ISBN 978-5-8200-0412-4
[8] Eliseeva L I 2015 Assessment of the competitiveness of agricultural enterprises in Yakutia Actual problems of education and science: collection of articles. scientific. tr., part 3 (Tambov) pp 59-61
[9] Eliseeva L I 2013 Prospects for the development of the agrarian sector in the Republic of Yakutia Actual scientific issues and modern educational technologies: collection of articles. scientific. tr. Part 1 (Tambov) pp 59-64
[10] Eliseeva L I 2013 Regulation of the labor market in the villages of the Republic of Yakutia Questions of education and science in the XXI century: collection of articles. scientific. tr. Ch. 1 (Tambov) pp 77-78
[11] Eliseeva L I 2013 Social security of the rural population Actual scientific issues and modern educational technologies: collection of articles. scientific. tr. Part 1 (Tambov) pp 64-66
[12] Eliseeva L I 2014 Technological properties of milk from cows of Simmental Kholmogorsk breeds and Yakut cattle International Agricultural Journal 4 pp 37-38
[13] Eliseeva L I, Lumbunov S G 2014 Economic efficiency of the production of dairy products from the milk of cows of Simmental Kholmogorsk breeds and Yakut cattle in the Republic of Sakha (Yakutia) Vestnik BGSKhA im. V R Filippov 4 pp 82-86
[14] Eliseeva L I 2016 Efficiency of using zeolite as a feed additive for cattle Proceedings of the International Research and Production Complex "Fundamental and applied aspects of feeding farm animals and feed technology", dedicated to the 120th anniversary of the birth of Corresponding Member VASKHNIL M.F. Tomme (Dubrovitsy)
[15] Korotov G P 1966 Yakutsk cattle (Yakutsk: Yakutsk book publishing house) 168 p
[16] Romanov P A 1978 Improvement of cattle in Yakutia (Yakutsk: Yakutsk book publishing house) p 152
[17] Forecast for the development of agriculture in the Far East for 2015-2020 (Khabarovsk)
[18] Key indicators of production and financial activities of enterprises and organizations of the meat and dairy industry in 2015 (Yakutsk)
[19] Key indicators of production and financial activities of enterprises and organizations of the meat and dairy industry in 2018 (Yakutsk)
[20] Chugunov A V 2012 Production and quality of dairy and meat products on the market (Yakutsk: Sphere) 154 p ISBN 978-5-91794-062-5