AGRONOMY, FORESTY AND WATER MANAGEMENT

General Farming and Crop Production

UDK 631.847.2126:633.1:631.87

Biologics as a factor of change in hyperspectral image indices (MRESRI, CPHL) of grain crops in Western Siberia

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Abstract, A large amount of information about the state of plants is obtained by applying the method of hyperspectral imaging, which is expressed by vegetation indices, including chlorophyll indices. Chlorophyll has two main components: chlorophyll a; chlorophyll b. They differ in their structure and distribution in nature. Hyperspectral imaging of the physiological state of crop plants allows you to manage qualitative and quantitative indicators of yield. The purpose of the studies is to assess the impact of biologics on changes in hyperspectral imaging indices and grain crop yields for the conditions of the Omsk Irtysh region. Studies were carried out in 2023, 2024. in the field experience of the southern forest-steppe of the Omsk region. Research objects: spring oat variety Siberian hercules, spring barley variety Omsky 101; bacterial preparation for inoculation of seeds Mizorin (active principle Arthrobactermysorens 7), preparation of nitrogen-fixing fungicide-stimulating bacteria Flavobacterin (active principle Flavobacteriumsp. L-30). MRESRI (+3.22 and 3.70 units), CPHLT (+4.13 and 0.74 units), CPHLA (+4.12 and 2.52 units) changed in hyperspectral imaging indices in spring barley inoculated with Mizorin and Flavobacterin seeds unit). In spring oat crops: CPHLT (+2.52 and 1.33 units); CPHLB (+1.80 and 0.80 units); Flavobacterin MCARI only (+3.73 units). In experiments when treating spring oat seeds with Flavobacterin, the yield conjugation with the indices CPHLT, CPHLA, CPHLB changed from average positive in 2023 (r=0.332) to strong negative in 2024 (r=–0.955). In experiments with treatment of spring barley and oat seeds by Mizorin, a strong direct correlation (r=0.736–0.932) of yield with MRESRI, CPHLT, CPHLA, CPHLB was noted.

Key words: hyperspectral image, vegetation index, biological product, oats, barley, yield

ANIMAL SCIENCE AND VETERINARY MEDICINE

Private Animal Husbandry, Feeding, Feed Preparation and Livestock Production Technologies

UDK 636.22.84

Features of lactation activity of cows with different levels of productivity after the first lactation

Olga V. Gorelik, Svetlana Yu. Kharlap, Artem S. Gorelik

Abstract. Modern dairy cattle, which are represented by highly productive animals of the Holstein breed, are distinguished by their outfit with good productivity indicators, strong constitution, and good suitability for industrial milk production. However, at the same time, a

significant variety of dairy characteristics with high variability is observed in herds of dairy cattle. The aim of the work was to study the characteristics of dairy productivity of cows with different milk yields after the first lactation. As a result of the conducted research, it was found that there is a decrease in productive longevity of cows in the herd with an increase of their milk productivity to 9129 kg after the first lactation, which is most likely due to the intensity of animal use at a young age. Productivity changes during the lactation activity of cows, which is a productive period, have features related to after the first lactation. Thus, cow's milk yield productivity after the 1st lactation, increases in milk yield with age by more than a third up to the 4th lactation, cow's milk yield of 9129 kg, decreases in milk yield after the second lactation. In the remaining groups, the highest milk yield is set for 2–3 lactation periods. The decrease in milk yield after achieving maximum lactation is not drastic. Holstein cows have no relationship between milk yield and milk quality. Most likely, they are determined by hereditary traits that were formed during the creation of this breed, and the conditions of animal feeding.

Keywords: Holstein cattle, cows, milk yield for the 1st lactation, milk characteristics, dynamics, productive longevity

UDK 636.32/.38:636.03:637.05

Nutritional value of meat products of young Tsigai breed and its crossbreeds with Edilbaev breed

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Abstract. The article presents materials on the study of the effect of the genotype of young sheep and castration on the chemical composition of the edible part of the carcass. The relevance of the topic is due to its focus on solving the state program for the development of the market of agricultural products, food raw materials and foodstuffs. This will contribute to the import substitution of meat and meat products. In this regard, the intensification of sheep farming will help to increase the competitiveness of the industry by significantly increasing the production of mutton, which is characterized by biological value, nutritional and energy value. At the same time, meat obtained from the slaughter of young sheep is essentially a dietary food product. As a result of the study, it was found that the crossing of the Tsigai and Edilbai sheep breeds and intensive cultivation of mixed young animals contributed to an increase in the mass fraction of dry matter at the end of cultivation at 12 months. In the edible part of the carcass of sheep by 1.05%, boulders by 1.20%, extracted fat by 0.82% and 0.91%, respectively, with almost the same protein content. At the same time, due to the more intensive course of fat metabolism in the body of the rolls, their advantage over the sheep was noted both in terms of the specific gravity of the dry matter in the pulp and the extracted fat. At the age of 12 months, this superiority of purebred sheep over sheep in terms of the first indicator was 1.76%, the second – 2.21%. In terms of crossbreeds, the advantage of boulders was more significant and amounted to 1.91% and 2.30%, respectively.

Keywords: sheep breeding, Tsigai breed, crossbreeds with Edilbaevsky, sheep, boulders, pulp, chemical composition

UDK 636.59.033

Growing of broilers on deep litter with varying air circulation intensity in poultry houses during the transitional climatic period of the year

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Abstract. The intensification of broiler meat production is associated with the need for additional control of technological processes. One of the main conditions for the effective growing of chickens, along with the genotype and factors determining the phenotype of poultry, is the microclimate in the poultry houses of industrial enterprises. As practice shows, it is currently not enough to control the air exchange and heating of poultry based on the indicators of the microclimate controller. In studies performed in March-April 2024 at the poultry farm of Naberezhnye Chelny-Broiler LLC (Republic of Tatarstan) in a continental climate, Ross 308 cross broilers were raised to 39 days of age. For the experiment, 3 groups of day-old chickens were formed, which were placed in three different production buildings. The air exchange in the poultry house was provided by supply and exhaust ventilation, operating on the principle of negative pressure. In experimental groups 2 and 3, additional elements of the ventilation system were used to increase the uniformity of air exchange – SF-550-02 circulating axial fans, each with a capacity of 8,5 thousand m^3/h (in group 2 – 3 units, in group 3 – 5 units). It has been experimentally established that in order to increase the zootechnical and economic efficiency of broiler farming, reduce the amplitude of temperature, relative humidity and eliminate microclimatic zonation in poultry houses, taking into account the calculated values of the microclimate uniformity index, it is recommended to increase the intensity of air circulation during the transitional climatic period of the year by applying additional air circulation with an intensity of 25,5 thousand m^3/h using 3 circulation fans, each with a capacity of 8,5 thousand m^3/h in an enclosed space with a total floor area of 1152 m^2. The circulation fans should be switched on starting from the age of 10 days of the broilers, synchronously with the operation of open-burning gas generators.

Keywords: broilers, microclimate, microclimate uniformity index, air exchange, air circulation, zootechnical and economic efficiency

Breeding, Selection, Genetics and Biotechnology of Animals

UDK 636.234.1:636.082

The relationship between the breeding value index for milk yield and the exterior assessment of Canadian Holstein daughters

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Abstract. The authors of this article examined the relationship between the breeding value of sires and the conformation assessment of their daughters. The method involves determining the proportion of optimally developed conformation traits in the daughters of compared sires and establishing a body type category using a special scale. The aim of the study was to conduct a comparative analysis and then determine the correlation coefficient between the breeding value for milk yield and the conformation assessment of the daughters of 34 Holstein sires of JSC

«Head Center for Reproduction of Agricultural Animals» (Moscow Region). The subjects of the study were Canadian-bred Holstein sires belonging to the Reflection Sovereign 198998 (n=18) and With Back Ideal 1013415 (n=16) lines. The study found that, in terms of average breeding value for milk yield, sires of the Reflection Sovering 198998 line statistically significantly (p>0,999) exceeded sires of the With Back Ideal 1013415 line by 150 kg. The average conformation score of daughters of sires of the Reflection Sovering 198998 line was higher than that of sires of the With Back Ideal 1013415 line by 15,3 (p>0,999). A positive average correlation (+0,406±0,143; p>0,99) was established between the breeding value and exterior assessment of the daughters of Canadian-bred Holstein bulls, and, therefore, the selection of breeding bulls based on breeding value leads to an improvement not only in milk productivity, but also in the exterior of their daughters.

Keywords: Holstein breed, cow, sire, breeding value indicator, milk productivity, exterior evaluation, correlation

UDK 636.234.1.03

Selection and genetic parameters of Holstein cows depending on the polymorphism of the kappa casein gene (CSN3)

Orest A. Basonov, Daria V. Borisanova, Anna S. Kulatkova

Abstract. The article presents the results of a study of the relationship between the polymorphism of the kappa casein (CSN3) gene and the breeding and genetic parameters of the Holstein cattle breed. Calculations of the analysis of variance (ANOVA), correlation dependence and the main breeding and genetic indexes are given. The population of Holstein cows is in the Hardy – Weinberg equilibrium. In the Vis Back-Ideal line, a positive correlation is observed among all the generations of the relationship of features. In animals with the $CSN3^{AE}$ genotype, there is a strong positive correlation in the daughter-mother and daughter-mother generations. A high degree of correlation was found in the Reflection Mastering line for cows with the $CSN3^{BE}$ genotype (r=0.83). Cows with the $CSN3^{AA}$, $CSN3^{AB}$, and $CSN3^{BB}$ genotypes have a moderate positive correlation; it is not statistically significant within the framework of ANOVA. The correlation between the milk yield of daughters and mothers in cows with the $CSN3^{AE}$ genotype is weak and negative (r=−0.07). The combination of certain alleles of the kappa-casein gene in combination with high maternal productivity results in maximum dairy productivity of cows, the genotype has a statistically significant effect on productivity. To predict the productivity of daughters, it is necessary to take into account the productivity of mothers, and for genotypes $CSN3^{AA}$, $CSN3^{AB}$ and $CSN3^{BE}$ (Reflection Mastering lines), it is also necessary to take into account the productivity of mothers of mothers. At the same time, the milk yield of mothers and fathers in this line also has a high share of influence (at the level of 33%). The highest breeding differential (SD) was obtained in animals with the $CSN3^{AA}$ genotype (Vis Back Ideal line) and amounts to 568.7 kg, which indicates the presence of reserves for improving milk productivity.

Keywords: Holstein breed, kappa-casein, milk productivity, selection and genetic parameters, analysis of variance, selection effect

AGROENGINEERING AND FOOD TECHNOLOGIES

Technologies, Machines and Equipment for the Agro-industrial Complex

UDK 621.313.2-8

Inertial-electric starter system for starting an internal combustion engine

Aleksandr Kh. Abaev, Elvira K. Kachmazova, Akhmad M. Umirzokov

Abstract. This article focuses on improving the reliability of starting internal combustion engines (ICEs) at low temperatures. Methods for effectively starting ICEs at low temperatures are explored. To improve the reliability of starting an internal combustion engine at low temperatures, the automotive industry has taken the path of reducing crankshaft rotational resistance by pre-heating the engine (warming up the coolant in the cooling system and warming up the oil in the engine sump). In addition, scientists have published works and received patents for inventions dedicated to the efficiency of engine starting at low temperatures by improving the quality of the engine starting system. However, these engine starting system designs have not been implemented in the automotive industry, some due to design imperfections that reduce the lifespan of their components, others due to design complexity that increases the weight of the unit and causes prolonged stress on the battery. An efficient inertia-electric starter system for starting an engine at low temperatures has been developed. The system consists of a battery, a three-position ignition switch (two-position for diesel engines), an electric starter, a traction relay with a winding and a normally open contact, a pinion drive lever, a drive pinion, a crankshaft flywheel ring gear, an electromagnetic clutch, a flywheel, and an overrunning clutch. The overrunning clutch, flywheel, and the drive half-clutch of the electromagnetic clutch are fixedly mounted on the armature shaft. The drive pinion is mounted on the driven shaft of the electromagnetic clutch half-clutch using a splined connection. The developed inertial-electric starter system will ensure trouble-free starting of an internal combustion engine (ICE) using a starter with the armature pre-spinned to its highest speed. This utilizes the moments of inertia of the starter armature, overrunning clutch, flywheel, and the half-clutch of the leading electromagnetic clutch.

Keywords: electric starter, gear, flywheel ring, storage battery, electromagnetic clutch, starting relay, overrunning clutch

UDK 637.1

Theoretical aspects of the influence of milk transportation modes in flow lines on the process of fat phase destabilization

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Abstract. During transportation and initial processing in milking lines, milk is subjected to strong hydromechanical forces, resulting in foam formation. The degree of impact on the particle size distribution of milk fat depends on many factors, including the milk flow pattern, the configuration and surface condition of the lines, and the duration of transportation. Milk flow is

typically unsteady, with high instantaneous velocities and accelerations, indicating turbulent flow. It is also important to note the high saturation of milk with air bubbles, which in turn contribute to the destabilization of the milk's fat phase and the formation of oil agglomerates. The formation of oil agglomerates is well explained by the physicochemical (flotation) theory of oil formation. The degree of hydromechanical impact on the fat phase of milk, depending on the speed and duration of transportation, can be explained by the Cook-Aseikin hydrodynamic theory of butter formation, which is based on the crucial role of the separating effect of microvortices formed in the turbulent flow of milk. As milk moves, its temperature, viscosity, and density change, which determine the effectiveness of the vortex's separating action and the influence of roughness on flow separation and microcyclone formation. The study's results showed that the overall separating effect of vortices increases with increasing milk transportation time, since the duration of the separating effect, like the lifetime of the vortices, is directly proportional to the transportation time. When transporting milk at a speed of 2.0 m/s, destabilization of fat particles statistically significantly occurs with a transportation time of more than 15 seconds and reaches 20% with a transportation time of 60 seconds.

Keywords: flotation, oil formation theory, laminar and turbulent flows, velocity, acceleration, boundary layer, temperature, kinematic and dynamic viscosity, density, hydraulic resistance

UDK 631.372

Dynamics of turning a wheeled tractor on a slope

Kazbek D. Kudziev, Mukhtarbek A. Kubalov, Alan M. Aguzarov

Abstract. The problem of preserving soil fertility is particularly acute in mountain agriculture, where water erosion causes significant damage. The most accessible and effective method of combating erosion on slopes is the use of special tillage technologies, in particular contour farming, in which the unit moves across the slope. Under such conditions, the main indicators determining the quality of the technological process are the stability and controllability of mobile machine-tractor units (MTU). A system of equilibrium equations was compiled, taking into account the geometric parameters of the tractor, the slope steepness, the redistribution of vertical soil reactions across the wheels, as well as the phenomenon of tire lateral slip. Unlike the common approach of digital integration, the authors apply analytical methods to solve differential equations of motion. As a result of complex transformations, a differential equation describing the dynamics of tractor turning on a slope was obtained, which is further presented in the form of a transfer function. It is shown that the structure of the transfer function of a wheeled MTU on a slope represents a series connection of a second-order inertial element, an integrating element, and an isodromic (first-order lead-lag) element. Using the MTZ-82 tractor as an example, with expressions for the transfer function coefficients, graphs of their dependencies on travel speed (in the range of 1–3 m/s) and slope steepness (up to 15°) were plotted. It was established that all coefficients increase monotonically with increasing speed and decrease with increasing slope steepness. The obtained analytical expressions make it possible to assess the influence of design parameters and operating conditions on the unit's controllability at the design stage, which helps to reduce costly experimental research.

Keywords: water erosion, wheeled tractor, motion stability, lateral slope, tire side slip, transfer function, turning dynamics, center of mass, contour tillage, mathematical mode

UDK 631.554

Improving the efficiency of transport and technological services for the grain harvesting process

Bela L. Uzdenova, Yuri A. Shekikhachev

Abstract. Selecting harvesting technologies for early grain crops is crucial for improving harvesting efficiency when agricultural enterprises lack combine harvesters and when weather conditions during the harvesting period are unfavorable. This provides the basis for developing methods for coordinating harvesting and transportation operations using both separate and direct combining technologies. Therefore, the purpose of this study was formulated: to examine the situational conditions that arise during grain harvesting when coordinating harvesting and transportation operations and their impact on harvesting efficiency. Based on an analysis of the "field-combine-two vehicles" system, it was established that the distribution of the duty cycle durations of each vehicle should be identical. At the same time, the distribution of durations between adjacent arrivals of vehicles ready to service the combines has a specific theoretical distribution. The mathematical expectation of this distribution, under ideal system operation (vehicles arriving in the field without any delays), will be half the mathematical expectation of the duty cycle duration of a single vehicle. Coordination of harvesting and transport operations is achieved by equalizing the durations between successive combine harvester orders for unloading the bin and between successive vehicle arrivals in the field after servicing individual orders. The probable nature of these durations requires defining parameters and theoretical laws governing their distribution. These parameters should be predicted in advance, and this basis should be used to justify management decisions that ensure the coordination of relevant operations, the selection of the transport method, and the establishment of the structure of the grain harvesting system's transport subsystem. Using a reloader reduces combine harvester downtime by 12%, which in turn increases their productivity, but its use does not affect the duration of vehicle downtime.

Keywords: grain crops, harvesting, transportation, combine, vehicle, coordination

UDK 631.333.92

Scientific substantiation of measures to improve the efficiency of animal waste disposal for small-scale farming

Lyudmila Z. Shekikhacheva, Disana S. Apshatseva

Abstract. Environmental issues, particularly the depletion of traditional energy sources, are currently pressing. These challenges can be addressed by switching to renewable energy sources. Such a source is bioenergy. Bioenergy offers significant advantages over fossil fuels and other renewable energy sources, providing energy supply, efficient waste management, and improving living standards and well-being. Biomass-based energy systems contribute to sustainable development and environmental protection. Among the key reasons for the widespread use of renewable energy sources are their availability, versatility, and climate-neutral nature. Therefore, the development of industrial biogas production at specialized facilities is essential. Therefore, the goal of this study is to develop new energy-saving scientific and technical approaches that can be implemented on household plots and farms using an integrated resource-saving system utilizing small-scale bioenergy units. A comprehensive energy-saving system using small-scale

bioenergy plants for home gardens and farms has been developed. The study revealed a dependence of biogas yield on the organic feedstock load, temperature, and pH of the digested waste. Furthermore, the most productive associations of anaerobic bacteria were selected depending on the type of organic feedstock. It was found that the selection of productive associations of anaerobic bacteria in each specific case can be achieved using a specially designed digester. A small-scale bioenergy plant, processing 100-150 kg of organic waste per day, can produce 110-170 kg of liquid fertilizer, which is sufficient to maintain the fertility of land plots in home gardens and farms.

Keywords: livestock waste, substrate, utilization, bioenergy, fermentation, biogas

Food Systems

UDK 663.8

Use of secondary raw materials and herbal ingredients in the production of functional beverages

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Abstract. The study is devoted to the development of formulation solutions for the production of beverages from recycled raw materials fortified with native compounds of plant raw materials to give the finished product specialized dietary properties. The object of secondary processing was the grape pomace of technical varieties, which is a waste product of winemaking and forms up to one-fourth of the mass of the processed berries. In order to form a liquid base for a functional drink, we obtained aqueous extracts from grape pomace, black and green tea, and hibiscus, which were selected in such a way that the drink would contain pectin, polyphenols, tannins, and other substances that would give the product preventive properties. The assessment of the physical and chemical properties of the grape raw materials revealed a significant amount of pectin and polyphenols in both the grape juice and the pomace, which confirms the technological and functional significance of these substances.

Keywords: grapes, pomace, extracts, tea, hibiscus, functional drink, polyphenolic substances, antioxidant properties

UDK 664.681.2

Determination of the optimal parameters of the waffle semi-finished product baking process

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Abstract. Waffle dough is a suspension of flour particles covered with hydrate shells in an aqueous liquid phase. The dough has a liquid consistency, which makes it possible to produce thin waffle sheets, the main semi-finished product of waffle production. The purpose of this study was to establish the optimal baking regime and the basic patterns of heat and mass transfer in a colloidal capillary-porous dough, which is the main semi-finished product of waffle production. Based on

the modern achievements of the theory of heat and mass transfer, the main patterns of energy transfer in waffle dough were established. In the first seconds of baking, the waffle dough receives the greatest amount of heat from the heating surfaces of the mold, which leads to intensive mass transfer in the contact layer. As the baking process progresses, the intensity of heat transfer decreases due to the formation of a vapor layer between the waffle sheet and the mold, which reduces the actual contact area and mass transfer, which is further complicated by the removal of adsorbed moisture from the layer adjacent to the heating surface. Based on these findings, it was determined that the optimal conditions for baking waffle sheets are as follows: the mold temperature should be 170°C, and the baking process should last approximately 2 minutes. The residual moisture content of the sheets should be between 1.5% and 2.5%.

Keywords: wafer dough, baking, heat exchange, mass exchange, moisture, quality

UDK 664.681.15

Comprehensive assessment of quality and safety indicators of sugar cookies fortified with oat talkan

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Abstract. Amid rising consumer demand for functional foods enriched with valuable nutrients, developing innovative formulations and processing technologies for flour confectionery using domestic plant raw materials and eco-friendly methods gains critical importance. This study presents a comprehensive evaluation of quality and safety parameters for sugar cookies fortified with ozone-treated oat talkan. Research objects included oat talkan samples processed with ozone for 5 and 15 minutes, alongside control and experimental cookie batches incorporating the additive at 5–15% flour weight ratios. Comprehensive analysis encompassed physicochemical properties, sensory attributes of the finished product, quality dynamics during extended storage, and microbiological monitoring per current regulatory standards. The variant with 15% oat talkan relative to flour mass, combined with 15-minute ozonation, proved optimal for fortified sugar cookie production. Samples subjected to extended ozonation showed no spoilage or quality degradation after four months, unlike the control, which lost sensory properties by the third month. The proposed guaranteed shelf life for oat talkan-enriched sugar cookies is 120 days. This solution demonstrates industrial feasibility and scaling potential to other flour confectionery products.

Keywords: sugar cookies, oat talkan, ozonation, sensory properties, microbiological safety

UDK 664.34:641.55/.56

Fatty acid composition, properties and prospects for using Yemen sesame oil

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Abstract. Sesame seeds (*Sesamum indicum* L.) have been cultivated for thousands of years and are widely used in the food industry, cooking and various agricultural industries. The purpose of this article is to study the fatty acid composition and physicochemical properties of sesame seed

oil grown in the Republic of Yemen. The paper describes the methodology for preparing sesame seeds, oil extraction, fatty acid composition and physicochemical properties of sesame seed oil grown in the Republic of Yemen. The study shows that sesame oil plays a significant role in the traditional cuisine and culture Republic of Yemen, and is also widely used in the modern food industry. The oil is used in technologies for preparing a wide range of food products, such as bakery products, desserts and confectionery. The fatty acid composition and properties determine the prospects of using oil obtained from *Sesamum indicum* seeds as a functional food ingredient in the diet of the population of the Arab states and a component of recipe compositions of traditional and modern culinary products, as well as an effective technological resource in the process of manufacturing food products. The qualitative and quantitative profile of lipid components testifies to the potential role of sesame oil in ensuring the rational nutrition of the population of the republic.

Keywords: sesame seeds, oil, fatty acid composition, physical and chemical properties, food products, Republic of Yemen

UDK 664.8

Comparative analysis of the nutritional value of vegetables preserved by convective and infrared drying methods using the example of onions, beetroot, carrots and potatoes

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Abstract. Providing organized groups with high-quality vegetable products all year-round is a complex task. The lack of scientifically substantiated ratios for substituting fresh vegetables with dried ones for modern drying methods creates the risk of inappropriate dietary planning. The objective of the study was to scientifically substantiate and experimentally confirm that modern drying methods (infrared), when optimal process parameters are observed, do not lead to a critical loss of the nutritional value of vegetables, providing a product suitable for full or partial prescription replacement of fresh raw materials in child and social nutrition systems. The objects of the study were beetroots, carrots, onions, and potato tubers from the 2024 harvest, as well as samples subjected to convective and infrared drying. Convective drying was carried out in a two-stage mode (80±5 °C and 50±5 °C) to a moisture content of 7–8%, while infrared drying was carried out at 55±2 °C for 1.5 hours. Protein, fat, carbohydrate, moisture, and vitamin C content were determined using standard methods. Infrared drying preserves 60–71% of vitamin C, which is 1.3–1.5 times higher than convective drying (48–57%). Recovery ratios were determined to ensure a 95–104% macronutrient balance with fresh vegetables: potatoes 1:4.2; onions, carrots, and beets 1:6.2–6.4. The ratios in prepared dishes are virtually identical. In organized meals, dried vegetables, when properly reconstituted, can serve as a complete alternative to fresh ones.

Keywords: dried vegetables, infrared drying, convective drying, nutritional value, vitamin C, recipe substitution, organized food service

ECONOMY

Regional and Sectoral Economy

UDK 338.43:339.5

Alarming trends in the export and import of food products and agricultural raw materials

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Abstract. Foreign trade in food products and agricultural raw materials is a key driver of agricultural growth and the overall economy. On the one hand, it expands the spatial and national economy, creating a kind of quasi-territory. On the other hand, it attracts investment into the national economy, creates new value chains, and integrates national agriculture into regional and global economies. Foreign trade in food products and agricultural raw materials is one of the most dynamically developing sectors of the national economy. At the same time, despite a positive trade balance in recent years, the country remains dependent on imports for certain commodities. The authors analyze the dynamics of export-import transactions, identifying key imbalances, such as increasing import dependence for critical product categories while simultaneously reducing the competitiveness of a number of domestic export products. The paper argues that current alarming trends (price disparities, increased sanctions pressure, and the deterioration of logistics corridors) require adjustments to state agricultural and foreign trade policies. Moreover, a large share of exports is made up of so-called raw materials-grain, meat, etc.

Keywords: agriculture, foreign trade in agricultural products, export, import, prices, food and market trends

UDK 338.439.02

State support as a factor in ensuring food security: priorities and implementation mechanisms

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Abstract. This article presents a comprehensive analysis of the current level of food security in the Russian Federation and substantiates promising areas for its improvement. It provides up-to-date data from the 2025 Global Food Security Index for cross-country comparison, according to which Russia belongs to the group of leaders with a low level of hunger. At the same time, the actual parameters of the country's food supply to the population are assessed, and industry segments of the agro-industrial complex are identified where production volumes do not reach the normative values established by the Food Security Doctrine, primarily for dairy products, vegetables, fruits, and berries. A mechanism for increasing production efficiency in import-substituting industries is substantiated, based on systematic state support for agricultural producers. Food subsidies, as well as interest rate subsidies on long-term investment and short-term loans, are proposed as priority forms of such support. Using the example of the Kabardino-Balkarian Republic, it is shown that subsidizing investment loans demonstrates higher efficiency

compared to short-term lending. Directions for improving state support are proposed, including a transition to a program-targeted principle with the establishment of key performance indicators, strengthening the targeting of subsidies for small businesses, developing agricultural insurance mechanisms, simplifying access to concessional lending, and stimulating the introduction of innovations. A conclusion is made about the necessity of consolidating budgetary instruments with long-term strategic priorities of food security.

Keywords**:** food security, government support, agro-industrial complex, subsidies, import substitution, technological sovereignty, Doctrine of food security, concessional lending