ISSN 1068-3674, Russian Agricultural Sciences, 2017, Vol. 43, No. 6, pp. 510–511. © Allerton Press, Inc., 2017.
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ANIMAL HUSBANDRY

Biological Aspects of Livestock Intensification

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Received May 24, 2017

Abstract—One of the main goals of the Russian agro-industrial complex is striving to achieve world indices. To achieve this, the fundamentals of the Russian grain economy have been revised; elevator farming and forage production are brought to the modern level. Russian production of grain-forage has been improved: the content of food grains in it is reducing and the content of barley, leguminous, and corn is increasing. These lead to cropping increasing of the mentioned crops. As a substitution for soy protein, protein of lupine and peas are offered. This protein is almost equal in quality to soy protein but is much cheaper. Further investigations on the cattle physiology will help to reveal the genetic potential of calves and cows.

Keywords: livestock, forage production, intensification, physiology, food

DOI: 10.3103/S1068367417060106

By the turn of the 21st century, the following model of food consumption for countries with developed economies formed approximately 800 kg of grain per capita per year (including 100–150 kg in the form of bread products and 650–700 kg in terms of eggs, meat, milk, etc.); that for the rest of the countries is approximately 200 kg of grain per person per year (in the form of bread products). The main indicator of the diet is the consumption of protein of animal origin. The world produces approximately 70 mln t of animal protein per year or approximately 10 kg per person per year, that is, 30 g per day [1, 2].

Active scientific development made it possible to abandon the old approaches in agriculture, developing new technologies that enabled intensive growing of grain crops, receiving 2.0 bln t a year with an increase to 500 mln t of oilseeds and legumes. This allowed the implementation of intensive livestock breeding, eliminating the food deficit in many regions of the world. A rapid increase of the population on the planet is accompanied by an increase of the number of productive animals and of the livestock production. The total volume of world meat production is approximately 300 mln t and milk is approximately 740 mln t. World production of all types of meat reaches 42.9 kg per person per year, including pork (15.9 kg), beef (9.1 kg), poultry (13.0 kg), and small cattle (2.0 kg). This is accompanied by an increase of international trade of animals and livestock products. The main sellers in this industry are countries with developed economies [1, 2].

At present, the Russian agro-industrial complex is slightly behind the world according to some indicators. For example, early maturity of pigs of a large white breed of domestic selection is 201.2 days, that of Canadian selection is 189.1 days, and that of Danish is 190.6 days. At 100 kg in large white breed pigs of domestic and foreign breeding, the linear sizes of the carcass are 95.3 and 98.0 cm, 39.5 and 55.5 cm^2 for the loin eye areas, 2.45 and 1.42 cm for the thickness of the bacon, 4.97 and 5.00 for the meat/bone index, 8.0 and 11.7 kg for the mass of the rear third of the side, and 1.73 and 2.02 for leanness index (meat/fat), respectively [3].

The main task of successful competition for domestic manufacturers for entering the international market is to make a technological leap by reducing the cost of products. There are such enterprises in Russia. To increase their number, it is necessary to solve the problems of grain shortage and imperfection of feeding. The genetic potential of animals allows us to solve these problems. The lack of feed grain can be eliminated by increasing the production of leguminous crops and by use of fully balanced feeding. At present, reserves of feed grain are increasing; they can eliminate the risk of underfeeding of productive animals [2, 4].

In recent years, the level of meat production in Russia has increased by 33% with the invariance of milk production. An important task is to increase the production of milk and meat and increase the competitiveness of livestock products on the domestic and foreign markets.

The revision of the Russian grain economy is under way, and the elevator farm and mixed feed industry are being upgraded to the modern level. There is an

understanding of the need to reduce purchases abroad of feed grain, high-protein feed additives, and growth stimulants. At present in Russia, grain is approximately 65–70% of the total volume of raw materials processed for mixed fodders, whereas this index does not exceed 50% abroad. This turned out to be possible due to the increase of the content of high-protein raw materials, energy-rich products, due to the introduction of products received in various cycles of the processing industry [2, 4]. Optimization of fodder production will proceed by improving the domestic production of grain fodder: the content of food grains in it will be reduced and the content of barley, leguminous, and corn will be increased; their crop is increased. Also, the areas of sunflower, soybeans, rapeseed, and other oilseeds are being increased. This will lead to increase in the production of oilcakes and oilmeal for livestock.

The problem of the protein content increase in concentrates is urgent. Russian cattle breeding is provided with imported soy protein by almost 60%, which is not justified in modern conditions. As substitutes for soy protein, proteins of lupine and peas are offered; they are almost equal in quality to soy protein but much cheaper. Mixed fodders currently contain not more than 14% of proteins in comparison with the physiologically necessary 18%. Achieving the balance of proteins in mixed fodders will ensure an annual saving of 12–15 mln t of feed grain. Domestic production of protein raw materials is not yet fully satisfying the needs of Russian livestock. Its procurement abroad causes the increase in the cost of mixed fodders, reducing their demand and the volume of production. To improve the situation, it is necessary to control the feed quality during their production. We need a thorough analysis of raw materials and the production process; this will make it possible to obtain high-quality feed. Suppliers of biologically active substances usually do not analyze the products that they sell. It is necessary to define many indicators and correctly interpret them taking into account achievement of their balance with other components of premix [2].

The emergence of diseases in the phase of newborns leads to a certain lag in the development and deterioration of the productive qualities of young animals and a decrease in the viability, safety, and productivity of these animals. Up to the present, there have been deficiencies of microelements and functional digestive disorders in the structure of dysfunctions in newborn calves in Russia, which bring sufficient economic damage on the economic scale. For the steady growth of livestock production, new physiological knowledge is needed on productive animals [5, 6] in order to realize their genetic potential [7, 8]. An important aspect of the studies that can provide a practical solution in terms of increasing and preserving the productivity of animals with advancing age are the evaluation of the dynamics of the integrating systems activity in ontogeny of the organism and the search for approaches to their regulation at any age [9]. The blood system is promising in this regard [10–12]. Practical application of the obtained knowledge about the blood dynamics in cattle development is able to open another path of animal husbandry intensification.

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Translated by T. Kuznetsova