PROMOTING SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT IN RUSSIA: STRENGTHENING THE ROLE OF FARMERS

Alexander A. Zhuchenko
Russian Academy on Agricultural Sciences, Moscow, Russia.

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Summary

Russia has an enormous agricultural territory, a significant part of which is in unfavorable soil, climatic and weather conditions. All this predetermines an important role for chemical and technogenic land reclamation. At the same time unilateral and mainly chemical-technogenic intensification of Russia's agricultural industrial complex has generally not been effective and should be combined with full and, mainly, differentiated use of natural, biological, material and social/economic resources.

Such a strategy of intensification is called an adaptive strategy. Principles of unity of economy and ecology, as well as harmonization of relations between society and biosphere are laid in its basis within the process of agricultural management. The main criteria for adaptive agriculture are resource- and energy-saving, ecological safety, steady development and profitability.

1. Soil-climatic, relief and weather conditions in the main agricultural zones

The territory of Russia is characterized by great variability of soil-climatic and weather conditions; the lack of heat and water in the main agricultural zones complicates agricultural production. The duration of the frostless period varies in the eco-agricultural zones of Russia within a range of 50 to 190 days. The sum of active temperatures (more than +10 ^{o}C) varies from 1400 to 3600 ^{o}C, and the humidity

coefficient varies from 0.10 to 0.60. The classified list of soil varieties has about 10 000 units. Considerable areas of arable land are characterized by diversity of soil cover. From 222 million hectares of arable lands, about 54 million has been either eroded or is vulnerable to erosion; about 50 million hectares is excessively acid, 40 million is saline, and 38 million is prone to water-logging or covered by stones.

The long-term potential increase of arable land in Russia has been estimated at 45 to 70 million hectares. However the major part of these lands lies in cold and moderately cold climatic zones, as well as in insufficient water-supply zones. The influence of uncontrollable environmental factors (droughts and dry winds, frosts, short vegetation period, etc.) on crop yield quantity and quality in the unfavorable soil-climatic conditions is sharply increasing, and efficiency of the use of technology is reducing.

There are clear biological limits to the zones where the main crop plants can be grown within the territory of Russia. Therefore the necessity of adopting a different approach to soil-climatic, relief, and other natural agricultural factors is sharply increased.

2. Natural conditions and crop yield

Natural conditions have to determine the spatial distribution of agriculture, specialized zones and belts, as well as the inter-regional food market development. The attempts to reach food "self-sufficiency" within separate administrative regions is aggravating Russia's agricultural crisis.

Unfavorable soil-climatic and especially weather conditions are ones of main causes for the high level of variation in crop productivity over most of Russia. For example, in the twentieth century there were fourteen major droughts in the European part and eight in the western Siberian part of Russia. Over the last five centuries these phenomena occur, on average, once every ten years. Droughts and dry winds reduce the productivity of grain by 10 to 60%, fodder cultures by 20 to 50%, vegetables by 15 to 20%, and fruits by 25 to 54% or more. Strong soil and atmospheric droughts that cause heavy damage are observed almost annually on 70% of the land with grain crops. In southern regions summer droughts occur every second year, with 98% probability, and this phenomena reduces grain productivity by 0.5 to 1 ton per hectare and more (see Glossary). Crop productivity levels caused by weather conditions vary by a factor of two to three in the more stable, less drought-prone zones, and by four to five and more in the more unstable zones.

In addition to droughts, much crop damage is caused by strong frosts. For example, in the Volga River region the air temperature in some years is reduced to minus 40 to 48 ^{O}C. This causes losses of winter crops over millions of hectares. Productivity of summer wheat, summer rye, oats, barley, and peas and under the impact of frosts on young crops could be reduced by 60 to 100%, potatoes in the flowering phase by 60%, and winter wheat in the flowering phase by 20 to 65%. This high dependence on weather conditions has negative consequences for the whole supply chain of inter-branch (fodder and cattle-breeding production, reprocessing industry) and inter-regional links in AIC, considerably increasing the problem of regular supply of food products to the population and raw materials to industry.

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Biographical Sketch

Alexander Aleksandrovich Zhuchenko, Dr.Sci.Biol., was born in 1935. He is a well known for his work on ecological genetics of crops, as well as his strategy for adaptive agricultural intensification. In each of these areas he published basic monographs, which obtained world recognition.

He is a Professor, a corresponding member of the Russian Academy of Sciences, and academician of the Russian Academy of Agricultural Sciences. At present, his position is a Vice-president of the Russian Academy of Agricultural Sciences, and head of the Department of Genetics, Moscow Agricultural Academy named after K.A. Timiriazev.