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CROP ROTATIONS IN AGRICULTURE OF UKRAINE

The article highlights the biological, ecological and technological importance of crop rotation. The causes and consequences of the violation of crop rotation in agricultural production in Ukraine are disclosed. It is proved that under present conditions the basis of adaptive farming systems should be dynamic, combined and at the same time science-based crop rotations. Their introduction into agricultural production will stabilize land use, reproduction of soil fertility, improving crop productivity and preserve the environment

Keywords: agriculture, crop rotation, productivity, soil fertility, structure areas under crops.

At the present stage some dramatic social and economic changes of agriculture in Ukraine has gone through that led to the introduction of new forms of management based on private ownership of land and industrial property market relations were formed, which are based on commodity-money circulation in order to maximize profits. The consequences of these changes, as well as extensive long approach to land use resulted in an unstable state of the industry, violation of ecological balance in the environment and worsening of social tensions.

Currently under cultivation is about 80% of agricultural land but in some areas - more than 90, and in many areas this figure reaches 96%. This level of plowed land never observed in developed countries and in any country of the former USSR. For example, in Germany under cultivation is 32%, England - 18.5 and in the US - 20% of agricultural land.

The high level of tilled land led to the development of unprecedented erosion. Annual soil loss is about 600 million tons, including humus about 1 t / ha. The production of 1 ton of crop production in conventional grain units lost 7 tons of soil. Biological activity of the soil had decreased the resources of drinking and fresh water become contaminated and shortened.

For years unsuccessful reforms were violated developed in the pre-reform period land holdings projects, which provided scientifically based crop rotation - the backbone of agriculture. As a result, we have uncontrolled amounts of highly liquid, short-term crops that are sown for several years on the same fields, resulting in the loss of soil fertility and it's degradation. Large areas of major food crops - winter cereals - are placed after cereals and other low-quality precursors not covered by crop rotation system, and this leads to a shortage of grain yields and often total ruins of crops. Thus we usually get the products of poor quality.

However, the role of crop rotation in modern agriculture is due primarily to biological characteristics of field crops. Various plant or group of similar crops require different conditions of water or nutrient soil regimes, while affecting the properties of the latter. The technological importance of crop rotation is correct alternation of plants with their different biological requirements, in which each culture created

the best conditions for growth, development and high productivity.

Crop rotation provides a dual impact. Due to the rotation not only nutrients but also moisture can be better used, because the root system of plants reaches different depths. In addition, some cultures, for example legumes, are able to provide the soil with nitrogen, after them the soil is not depleted, but rather - fertile. One of the major objectives of the rotation is to provide plants with the best conditions for growth and development and to establish the proper conditions for growing the next crop.

However, permanent crops growing dramatically reduces their productivity, soil fertility, impairs phytosanitary status of soils and crops compared with the placement in rotation. Crops introduction to rotation, which are differed in terms of sowing and harvesting, in character of development, have different ways of care, promotes uniform distribution and rational management of means and manpower during the year.

Admittedly, the priority development of theoretical foundations of rotations (crops alternating) and principles of their construction in different soil and climatic zones and specialization of agricultural production belongs to the Ukrainian science.

Based on many-years of researches of national scientists developed and recommended for the farmers scientifically based principles of both types and sorts of crop rotations (from 3-5 to 6-10 fields). They respond appropriately for land reform and account zoning areas: Steppe, Forest-Steppe, Polyssya, areas of the Carpathians, Transcarpathia, Crimea, including irrigation and drained lands [1. 2]. They paid enough attention to crop rotation with vegetable crops and soil-conservative crop rotations, optimizing crop acreage structure and crop rotation system through simulation. Developed and recommended types and systems of crop rotations with different duration, appropriate crop rotation acreage structure, various sets, and ratio placement of crops that provides high quality products (grain, oil, sugar beet raw materials, fodder) and leads to high productivity of arable land. It is recommended for grain-producing farmers fallow-row cultivated crop rotations for farms in the Steppe and north-eastern parts of the Forest-steppe with grain specialization; grain-row,

crop altering, row cultivated crop rotations - for farms with highly developed livestock and grain specialization in all areas of Ukraine.

It's a shame, but it should be noted that in the European Union - 100%, while in the US - 85% of the land under cultivation is used in rotation, while we have crop rotations unfortunately affected.

The first thing depends on producers - is the development of crop rotation, which is primarily the basis of biologization farming systems.

Analysis of researches of the National Research Center "Institute of Agriculture NAAS" indicates that the share of mastered rotation has 33% increase in yields of winter and spring wheat, 14 - spring barley, 10 - maize, 35 - peas, 8-10 - buckwheat, 42 - soybeans, 22% sunflower. The value of the rotation for potatoes and sugar beet is particularly evident. According to the NSC "Institute of Agriculture NAAS" the average yield for 18 years at the permanent potato crop cultivation was almost twice lower than grown in rotation at one and the same background of fertilizing.

The results of the researches of Myronivka wheat institute named after V.M. Remeslo on average for 42 years found that the yield of sugar beet root crops in crop rotation was at 12.0 t / ha higher than the permanent planting without fertilizing, when farm yard manure fertilizing - 20.6 and with mineral fertilizers - by 19.6 t / ha.

Increase in crop production of fertilizer application was three times higher than growing crops in rotation compared to permanent crops cultivating. The fact is proved that only at developed rotation not only fertilizer system effectively manifested, but soil tilling and plant protection systems from pests and diseases.

During the laying of long-term crop rotation research field experiment in Myronivka wheat institute named after V. M. Remeslo there were 166 pieces of weeds for 1 m² after its development this figure fell to 30 pcs. / m² or decreased by more than 5 times.

The developed crop rotation is the main biological factor of production agriculture. Since ancient times, people noticed that a long growing culture in one field make significantly reduced productivity.

As a result of research the different reactions of crops were stated at their repeated growing and the reasons for the decline in yields permanent cultivation, which are caused by complex factors - soil exhaustion, multiplication of pests, plants' root secretions and soil microorganisms' excreta, diseases and weeds. Crop rotation expediency was established, efficiency of assimilation of nutrients and water from different soil layers, storage and use of biological nitrogen, facilitate expanded restoring of soil fertility and improve their phytosanitary condition.

In Ukraine there are 4 soil-climatic zones, 9 soil and climatic subzones, 222 agro-production groups of soils. If in period before the land reform in the use of collective and state farms was 98% of the land under cultivation, or more than 3,000 hectares on the every economy, now with agricultural use almost 15.3 million hectares of land falls and it is owned by the citizens (an average of 0.6 ha per owner) and to grow marketable

products is virtually impossible here. The farms have 3.8 million hectares (76.2 ha on average at the every economy) and the great part of farmers cannot use it effectively.

Now 19.4 million hectares (public, private and farmers) belong for the production of agricultural food goods.

Analysis of current land use found that most of received plots for gardening within the 4-5-6, and sometimes and 10-12 acres for growing agricultural products are not used. For example, over 60% of Kyiv residents use them for outdoor recreation.

In order to improve the efficiency of land use by different land users in the National Science Center "Institute of Agriculture NAAS" there were developed principles of crop rotation in agriculture for Steppe, Forest-Steppe and Polyssya of Ukraine [3].

Due to livestock and land size decreasing, market orientation of growing some crops, lack of logistical support and the high prices of machinery, agricultural implements, fuels and oil products is evident that the number of crops at all landowners fields will decrease.

Of course, the manufacturer has difficulty in determination which crops to grow in rotation and as they rotate. But there are general principles that can help him at an early stage. In particular, crop rotation with definite sequence or desired interval between crops become an obstacle to change the types of pests, diseases and weeds and minimize the possibility of developing resistant, tolerant or adapted species, since each species has its own "survival strategy"; with the development of livestock it is easier to diversify crop rotations through the use of feed and forage crops and sown fallows that increases the possibility of controlling the intensity of crop rotation; rotation should be dynamic, combined and scientifically based. Used crop rotation should be changed simultaneously with changes in the market environment, soil, climate and economic conditions. You can create many variations of rotation, but always justification requires for their implementation.

Accordingly, most landowners will develop crop rotations of short duration - from 2-fields (soy, corn) to 4-5 fields - with the inclusion of cereal crops, maize, sunflower, sugar beet and others.

The National Academy of Agrarian Sciences of Ukraine developed principles of rotation for the cultivation of major crops in farms of different ownership and specialization of plant production and for livestock feed provision. For each culture there were offered the best predecessors and permissible location and precursors, the one were stated followed by inappropriate place some crops cultures as well.

Principles of rotation construction guarantee the dynamic character, enabling them to improve constantly depending on the demand for food and raw materials for industry.

The main reason of ruined crop rotation system was an unilateral breach of conjectural market land use. A set and ratio of cultures exceeded the rational limit. Two groups of crops - cereals and oil - are mostly grown on large farms. As a result of unilateral soil exhaustion, negative results will be observed through decades of

heavy losses of soil fertility. It can then return at least in 50 years of large additional costs.

This individual land users excessively expanded acreages of sunflower, rape, maize, which has led and will lead to further spread of pests, diseases and weed-infested fields, violation of ecological balance in the landscape. According to the Weizsäcker (1994): "The market economy can destroy the environment and yourself, if you do not let the prices speak the ecological truth."

By the way, in 2014 in Ukraine sunflower acreage was 22% in the structure while the norm should not be more than 11%, and in one field sunflowers can be grown once in 6 years, and maize, cereals, legumes, rape - once in three years.

The area under cultivation of maize also wants to be limited in the method of rotation. The consequences of excessive expansion in Ukraine at the time were caused by the hazardous decision M.S. Khrushchev and led to the fact that white bread in the shops in the traditional grain-growing region like Poltava was sold by prescription.

Regarding the expansion of maize in Iowa (USA), the J. Russell Smith called this crop as "continents' killer" and one of the worst enemies of the human future, because every bushel of grain from Iowa is erosion of two soil layers, leading to widespread destruction of man-made agricultural areas, but in terms of monoculture situation further deteriorates.

In the situation now in Ukraine, when grain prices increased 4.5 times, fuel and lubricants - more than 40 times, nearly the same - fertilizers and pesticides, we need to develop adaptive farming systems based on land stabilization, restore the broken relationship between natural systems, increase the use of biological nitrogen by expanding acreages of legumes and grain legumes crops, to increase area of sown fallows with green manure plants in scientifically based crop rotations in different soil and climatic zones that improve the phytosanitary status of fields, the main indicators of soil fertility and are good precursors for winter crops. A strong root system of rapes, oil radish, white mustard, penetrating to a depth of more than 1.5 m, well drain soil enriching with organic matter; root and stubble slow down the development of diseases, when its pathogens are stored in the soil.

Growing basic and intermediate green manure crops as fertilizer is especially important way to improve low humus content light sandy soils, for the introduction of abandoned land in agricultural use or when replacing manure in cultivated crops.

Researches of NSC "Institute of Agriculture NAAS" when studying the effect of bean component in short rotations in revenues biological nitrogen into rotation through symbiotic and not-symbiotic nitrogen fixation found that for rotation with peas flow of biological nitrogen income ranged from 134 to 294 kg / ha, crop rotation with soybeans - from 264 to 312, in rotation with perennial grasses - 468 kg / ha, representing, respectively, 28-48, 57-62 and 89% of the total cost of nitrogen income in crop rotation, and biological nitrogen proceeds only through symbiotic nitrogen fixation in rotation of peas was at 69-254 kg / ha, of soybeans - 234-282, and in rotation with grasses - 428 kg / ha. Thus, in rotation with peas and soybeans removal of nitrogen from harvest was compensated from 18 to 56%, and in rotation with grasses - 81%.

Certainly, the strategic objective of introducing crop rotations caused primarily by the realization that it would be a mistake to assume that modern agriculture in a market economy should go on innovation with just the same type of short- or long rotations. At least that particular Forest-Steppe and Steppe of Ukraine - regions of large scale production of grain, sugar beets, sunflowers, etc., and the main producers are - also large farms. In such diversified businesses, it is advisable to introduce and develop rotation of long duration (7-9 fields), in the medium and small-scale enterprises - short rotation. Thus, different rotations have the right to exist. But which one to implement - the owner decides.

However, with the increasing of intensification of agricultural production, introduction of new technologies, high-productive varieties and hybrids of crops that have high demands on soil fertility, agricultural producers should remember that the problem of crops location cannot be wiped out, but there is more sharper considering environmental safety agriculture, environmental protection (agrolandscapes) for present and future generations. In this context, the development of domestic agriculture in national economic complex system is a top priority, always competitive in meeting human needs for food.

Література

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Сівозміни в землеробстві України

У статті висвітлено біологічне, екологічне та технологічне значення сівозмін. Розкрито причини та наслідки порушення сівозмін в агропромисловому виробництві України. Доведено, що в сучасних умовах основою адаптивних систем землеробства мають бути динамічні, комбіновані і водночас науково

обґрунтовані сівозміни. Запровадження їх у виробництво забезпечить стабілізацію землекористування, відтворення родючості ґрунтів, підвищення продуктивності культур та збереження довкілля.

Ключові слова: землеробство, продуктивність, родючість ґрунту, сівозміни, структура посівних площ.

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Севообороти в земледелии Украины

В статье освещено биологическое, экологическое и технологическое значение севооборотов. Раскрыты причины и последствия нарушения севооборотов в агропромышленном производстве Украины. Доказано, что в современных условиях основой адаптивных систем земледелия должны быть динамические, комбинированные и одновременно научно обоснованные севообороты. Введение их в производство обеспечит стабилизацию землепользования, воспроизводство плодородия почв, повышение продуктивности культур и сохранение окружающей среды.

Ключевые слова: земледелие, продуктивность, плодородие почвы, севообороты, структура посевных площадей.

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