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Scientific-and-innovative support of the further development of agroindustrial production of Central region

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The purpose. Filling up agrarian market of Central region of Ukraine with scientific-and-innovative products and increase of level of development of agricultural factories in state-of-the-art conditions of managing. **Methods.** Statistical-economic analysis, simulation, questioning, comparison, synthesis. **Results.** Scientific-and-organizational approaches, and market-oriented tools of experimental production and transfer of high technology products in agrarian and industrial complex of region are developed. Assessment of state-of-the-art situation and perspectives of innovative evolution of agricultural factories is carried out. Suggestions on filling up agrarian market with innovative products are elaborated: scientific-and-consulting and informational services through architecture of conferences, seminars, «Days of field», «Circular tables», courses, exhibitions-fairs; creation of scientific-and-demonstration and technological proving grounds, demonstration farms; publications in issuings, performances on radio and television, spread of booklets and issuings of recommendations. Data bank is created of the completed scientific developments (innovations) that are recommended for mastering in soil-climatic conditions of Kirovograd region, Portfolio for orders of innovative products (seeds, pedigree resources, hardware components, etc.) is generated. **Conclusions.** Analysis of overall performance of agricultural factories of Kirovograd region proves that nowadays only those of them which use innovative development and constantly or very often use scientific reaching at production of agricultural produce have stable financial and economic state. Mainly they are large enough factories which spend renewal of basic production assets and annually restore high quality content of cultivated crops. Application of innovations ensures resistant economic propagation, raises industrial and social evolution of a society, secures economic safety and stability.

Key words: *scientific-and-innovative security, agroindustrial production, scientific development, innovative products, tests, implementation.*

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Development of local government, formation of united territorial communities, transfer of resources and powers within decentralization of power reform, with adoption of the Laws of Ukraine «On Cooperation of Territorial Communities» (17.06.2014), «On Voluntary Association of Territorial Communities» (05.02.2015) and amendments to the Budget and Tax Codes, primarily involves improving of financial sufficiency, economic and investment prospects of territories for high-quality and comfortable living. Rural areas give precedence to the development of agroindustrial complex and farming. At the same time, agricultural production basis of welfare is not natural resources, but scientific achievements. Combination of several factors is important for the innovation development: availability of production, economic and financial base of agricultural enterprises, priority development of relevant industries, developed system of financial and credit support of agricultural production, availability of developed competitive market of agricultural production, functioning of consultancy system, scientific and consulting services for agricultural producers.

Aspects of the enterprises economic activities of various economy sectors are covered in a number of publications where innovations are considered as processes of transforming scientific knowledge into innovation. Among these scientific developments are the works of O. Vysochan, Y. Pikush [1], I. Vinnichenko [2], E. Saidablaeva [3], O. Shubravska and others [4, 5], G. Saranchuk [6]. At the same time, the impact of scientific and technological progress on ensuring the effective operation of the agroindustrial complex enterprises, the development of innovative processes and the implementation of innovative activities are not

sufficiently covered.

Many scientists have devoted their scientific investigations to the problems of theoretical and practical support of the innovative processes organization in agribusiness and determining their effectiveness: S.Volodin [7, 8], J. Gadzalo [8], M. Zubets, S. Tivonchuk [9], P. Sabluk and others [10], O. Malii [11], L. Omelianenko and others [12]. The study of innovation processes in the agroindustrial production shows a lack of sophisticated mechanisms for innovation activity and information support, effective methods of academic institutions interaction with innovation structures, government bodies and economic entities as well. Therefore, there is an urgent need to investigate and implement a single continuous process of institutional interaction between the development of innovations and its manufacturing application. In the EU, USA and Japan, these issues are considered within the promotion framework of venture companies, IT and biogenetic technologies [13-14]. The main difference in the development of this area in comparison with Ukraine is that these studies are concentrated mainly in large private companies: Monsanto, Bayer, BASF, etc.

The purpose of the research is to fill the agrarian market of the Central region of Ukraine with scientific and innovative products and to promote the development of agricultural enterprises in modern economic conditions.

Materials and research methods. The initial research work data is completed scientific researches, adapted to the conditions of the Kirovohrad region. Methodical approaches to the research according to number 44 of NAAS research work program«Innovative Development» during 2016-2020, which are based on the legislation in the field of innovation - the Laws of Ukraine «On Innovation Activity», «On Science and Scientific and Technology Activities», «On Science and Scientific and Technology Expertise», «About the Priority Directions of Science and Technology interaction», «About the Priority areas of innovations in Ukraine», «About Science Parks» and other regulatory acts governing social relations in the innovation sphere.

Research results. The scientific and innovative support of the agroindustrial production of the Kirovohrad region is provided by the regional Center, which operates on the basis of the Institute of Agriculture of Steppe zone of the National Academy of Agrarian Sciences of Ukraine. The Institute of Agriculture of Steppe zone of NAAS has the ability to transform scientific knowledge into the production of competitive agricultural products.

Successful operation at the innovative agrarian market is impossible without a constant demand analysis of scientific researches, evaluation of competitors and potential consumers of these products. In view of this, the institution conducts research works on the definition of the scientific and methodological foundations of the innovative agrarian science development, creation, testing and transfer of scientific achievements to the agroindustrial production of the Kirovohrad region. In the process of scientific researches aimed at identifying the ways of innovative development of agricultural production, the demand level for scientific advances in the agricultural sector and the probability of competition with similar scientific products are determined, methodological approaches are developed to predict the market filling with agricultural innovations and the demand for scientific advisory services is being studied.

The basis of the research was the results of questionnaire-based surveys of agricultural producers of various forms of ownership, which have been carried out annually by scientists of the Institute of Agriculture of Steppe zone of NAAS since 2007, in order to determine the scope of scientific achievements application in the agricultural sector and to study the demand for scientific advisory services.

The obtained data attests to the fact that the proportion of agricultural enterprises which constantly or quite often apply scientific achievements in their production during 2007-2017 has increased significantly and in recent years has been in average more than 70%against 67.7% in 2011 -2013 and 56.5% in 2007-2010. (Fig. 1).

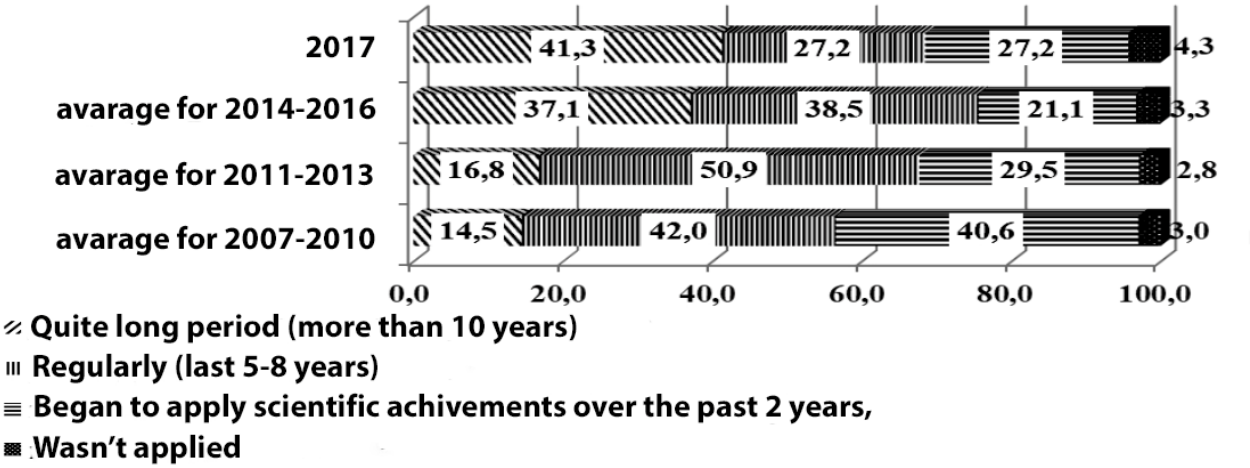
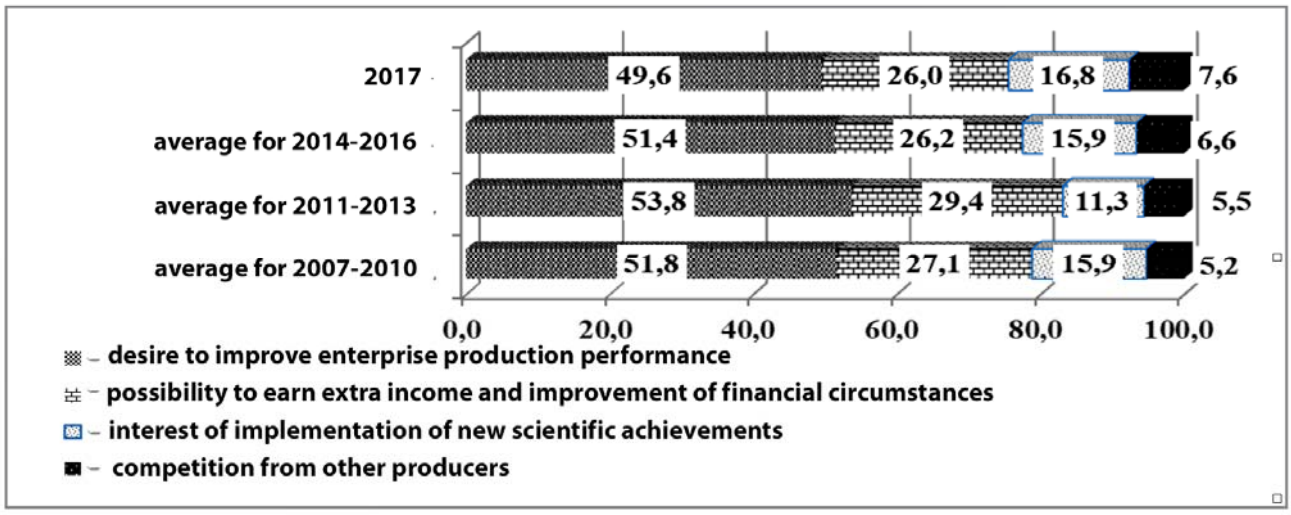


Fig. 1. Grouping of agricultural producers of Kirovohrad region by the duration of the innovations application, %

The proportion of respondents who have been applying scientific achievements for a long time (more than 10 years) has increased from 14.5 to 41.3% or in 2.8 times from 2007 to 2017. The increase in the number of agricultural producers over the years of surveys, which applied innovative achievements in their activities for quite a long period of time, led to a decrease from 41.3 to 27.2% of respondents who apply them regularly (over the last 5-8 years) and from 40.6 to 27.2% of those who are just beginning to introduce scientific advances in their production over the past 2-3 years. The number of agricultural producers who did not apply innovative achievements in their activities was very small during the entire survey period, it ranged from 2.8 to 4.3%.

Based on the monitoring of agricultural producers' motivation to scientific achievements application in agricultural production (Fig. 2), which was carried out during 2007-2017, it was revealed that over the entire research period, the main reason for innovations application was the desire to improve the productivity measures of enterprises(about 50% of respondents). Gaining extra profits and improving of financial circumstances, as the main impulsive force for the scientific achievements application in agricultural production, it is seen only by 26% of agricultural producers.

Fig. 2. Dynamics of changes in the motivation of agricultural producers to the scientific achievements application in agricultural sphere during 2007-2017,%



About 17% of respondents noted that the main reason for the scientific achievements application in production is the interest in the introduction of scientific advances. Competition with other producers forces only a small number of the respondents to apply scientific achievements in their production - 7.6%.

The survey findings of agroindustrial production managers and specialists, regarding the designation of position for priority implementation of strategic tasks by the state, which should help to promote the development of agrarian production, first of all reveal that agricultural producers consider it necessary to deal with the issue of the economic and financial mechanism. At the same time, the overwhelming majority of agricultural producers who look for ways to increase the level of agricultural production rely primarily on the state financial support by means of the regulation of price policy, investment and credit support for agricultural producers and reduction of the tax burden.

The Institute of Agriculture of Steppe zone of NAAS functions as an information and consulting center for scientific and methodological support of the innovation component of the agroindustrial production development in the following areas: crop and animal husbandry, agrarian economy and innovations transfer. The overarching aim of the institution is to promote scientific achievements and high technologies to the agrarian market, which contribute to the creation of an innovative component of the agricultural production development in the steppe zone regions.

At the present stage, the Institute of Agriculture of Steppe zone of NAAS owns 28 intellectual property objects (IPOs) including: 2 types of dairy and meat cattle breeds; 22 varieties and 2 hybrids of plants listed in the State Register of Plant Varieties of Ukraine for 2019 - 9 varieties of soybean (Izumrudna, Medeia, Valuta, Yuvileina, Znakhidka, Romashka, Zolushka, Feieriia and Zlatoslava); 7 varieties of spring barley (SN-28, Sozonovskiy, Svyatomykhailivskyi, Statok, Krok, Doridnyi and Samorodok); 5 varieties of sainfoin (Kirovohradskyi 22, Kirovohradskyi 27, Kostiantyn, Smarahd, Vehas); 1 variety of coriander (Oksanit); 2 corn hybrids (DK Veles and DK Burshtyn, created together with Institute of grain crops NAAS).

During 2016-2018, 68 developments were implemented in various sectors of the agroindustrial production in 159 enterprises and in 11 regions of Ukraine, 187 contracts of scientific support were concluded in the amount of about 3 million UAH. Most of the developments are introduced in several enterprises at the same time. A comprehensive scientific and consulting support for the development of research enterprises is underway for such state owned enterprises as experimental unit «Elitne»the Institute of Agriculture of Steppe zone of NAAS, experimental unit «Stavudlianske» the Institute of Agriculture of Steppe zone of NAAS, experimental unit «Chervonyi Zemlerob» Kirovohrad State Agricultural Experimental Station of NAAN, basicfarming enterprises «Pokrovske» of Kirovohrad and LLC «Prohres» Novomyrhorod district, public utility corporation «Yunist» Komushuvatska village council and Ivanovo «school I-III steps» Novoukrainska district council branch Dymynskiy teaching and educational complex of Novoukrainska district. Scientific and practical recommendations were developed for these enterprises and for cultivation of crops, livestock production, use of mechanical means and so on.

An innovation «the system of combined application of the biologicalization principles in short-crop rotations in insufficient moisture zones» was introduced in various business entities on a total area of 13.6 thousand hectares. The use of microbial drugs contributes to the economic efficiency with the natural fertility at 500-680 UAH/ha, mineral fertilizer system - 85-280 UAH/ha, organic-mineral - 95-320 UAH/ha. Additional conditionally net income of the introduction varies from 940 to 2750 UAH/hadepending on enterprise.

The introduction of «scientific and practical recommendations for the development of agrobiological approaches that would maximize the productive potential of winter crops in the conditions of insufficient moisture in the northern Steppe zone of Ukraine» provides: selection of the best predecessors (weed free fallow and soybeans for grain); optimal seeding time; use of plant-root and foliar fertilization. High crop yield after weed free fallow (6.15-6.18 t/ha, with a profitability of 158.6-161.9%) was provided by winter wheat seeded on the 25 of September and on the 5 of October, and after soybeans (5.68-5.78 t/ha, with a profitability of 162.3-166.3%) seeded on the 15 and 25 of September, based on plant-root fertilization in early spring with ammonium nitrate at a dose of N_{35} and foliar fertilization in carbamide N_2 booting phase and complex microelements. High winter barley after soybeans for grain (5.21-5.39 t / ha, with a profitability of

155.4-163.2%) formed seeded from the 15 to the 25 of September based on plant-root and foliar fertilization. Additional conditionally net income from the introduction - 4200 UAH/ha.

The scientific development «Biologized soybean cultivation technology in the conditions of the northern Steppe of Ukraine»states that plant productivity will be increased by 10-15%due to the biological nitrogen fixation by means of herbicides and disinfectants application. The expected economic profits are 900-1100 UAH/ha. Extra clear profits - 1180 UAH/ha; the prime cost of grain decreased by 697 UAH/t; level of profitability increased by 9.4%.

«Elements of an advanced technology for growing springhulless and film barley» were implemented in the enterprises of Kirovohrad region. By spring barley grown by its fore-crop, sunflower and maize for grain, crop productivity increased in comparison with the adopted technology by 0.26-0.55 t/ha (12.3-25.9%). The sales proceeds of grown products increased by 481-2247 UAH/ha, the prime cost decreased by 154.5-751.8 UAH/t, the profitability of growing increased by 2.9-16.1%.

The scientific development «scientific and practical recommendations on the use of resource saving bioadaptive technologies for growing maize in the enterprises of the northern steppe with various resource allocation» showed that hybrids and fertilizers have significant influence on crop productivity formation under insufficient moisture conditions (hybrids- 31% and fertilizers - 23%, seed time - 7%). The use of $N_{90}P_{45}K_{45}$ has increased the crop productivity of corn seeds by 1.46 t /ha (21%), and $N_{60}P_{30}K_{30}$ - by 1.03 t/ha (15%), compared to the background without fertilizers. Various hybrids response to fertilizers has been established. Against the background of$N_{90}P_{45}K_{45}$, under seeding at t_{soil}=12-14°C, higher crop productivity - 9.26-9.47 t/ha, was produced by hybrids DK Veles (FAO 270), DK Burshtyn (FAO 350) and under seeding at t_{soil}=16–18 °C - Shtandart, DN Vaitkorn (FAO 400) - 9.38–9.72 t/ha, while higher crop productivity without fertilizers - 8.37–8.50 t/ha seeding of hybrids DK Burshtyn and Shtandart undert_{soil}=16-18°C. Mid-season hybrid DK Burshtyn provided higher clear profit of 25.6 thousand UAH/ha, with210%profitability, against the background without fertilizers under seeding at t_{soil}=16-18°C. DK Veles hybrid is 24.3 thousand UAH/ha accordingly, 142% against the background of $N_{90}P_{45}K_{45}$, under seeding at t_{soil}=12-14 °C.

The innovative scientific development «Optimization model of the agricultural production structure by means of electronic flowcharts, provides the designation of agricultural production optimal parameters, taking into account the existing resource allocation and the introduction of innovative technologies through the economic assessment of electronic flowcharts and carrying out multivariate calculations, which will provide profitability increase of 15-25%, savings of combustive and lubricating materials for 20-25% due to their rationing. At the same time, the expected economic effect from the combustive and lubricating materials rationing in the above mentioned enterprises ranged from 1750 to 1812 UAH/ha of crop rotation.

The introduction of the scientific development «zonal technological complexes of high-performance agricultural machines for crop production and rational forms of their application» ensures the implementation of mechanized work with a scientifically based set of technical means in optimal agro-technical terms, contributed to an increase in the productivity of the main machine-tractor aggregates by 8-10% and reduction of fuel consumption for the main mechanized works up to 10%.

The scientists of the institution have established a system of onsite qualification courses for managers and specialists of agro-industry. Trainings for 12365 specialists of agro-industry were held and 16100 consulting services were provided during 2016-2018. Qualification courses for research scientists of NAAS on the subject of «Innovative approaches to the invention of scientific and technical developments, their testing, bringing to the level of innovation and their transfer», qualification courses for senior specialists and divisional managers of public corporation «Elvorti», study tour «development of rural areas through service cooperatives» for members of agricultural service cooperatives of 6 regions of Ukraine.

Special attention in the work of the center for scientific support of the central region is paid to the information provision of business entities, which is carried out by means of seminars, exhibitions and other events. Also during 2016-2018, research scientists of the institution took part in 77 conferences, 38 seminars, 92 meetings, 27 of which were of Ukrainian national level, 18 exhibition fairs, 29 field days, 12 of which were Ukrainian national. Scientists held 54 roundtable discussions, 307 publishing’s, developed and published 29

methodological recommendations, 3 scientific collections and 4 scientific reference publications. Scientists were on the air 61 times and appeared on television 19 times.

Considerable attention is paid to advertising and introducing into the production of high-productive varieties and hybrids of scientific institutions of the NAAS selections. That's why 9-12 scientific-technological and demonstration sites are annually created on the basis of the institution and of the network of basic entities, which cover a wide range of crop production scientific developments of the scientific research establishment of the NAAS system, where varieties and hybrids of 12-14 agricultural crops of different breeding centers are sown: about 100 varieties of winter wheat, 70 - spring barley and 20 - winter barley, 20 - spring wheat, 60 - soybeans, 90 - maize hybrids, 60 - sunflower hybrids and more than 50 other crops.

The website www.agronauka.com.ua operates on the Internet, there is also a continuous promotion of scholarly results and developments of the institution among the participants of the Agrarian Science Facebook group, in the agriculture business magazine GrowHow.in.ua (How to grow), in the agricultural sector entrepreneurs' newspaper «Agribusiness today» and other electronic and printed publications. The collection of scientific papers «Visnyk Stepu» are annually published on basis of all Ukrainian research to practice conferences. The system of business proposals of high-quality agricultural crops seeds produced by the Institute of Agriculture of Steppe zone of NAAS, network of research enterprises and scientific-advisory services of the institution by means of Internet (websites, online trading platforms, social networks, etc.) have been developed.

Research enterprises of the Institute of Agriculture of Steppe zone of NAAS (state-run research enterprise «Elitne» - Kirovohrad district, state-run research enterprise «Stavydlianske» - Olexandrivska district, state-run research enterprise «Chervonyi Zemlerob» - Bobrynets district) are the leading parts in ensuring production inspection and use of scholarly results in the steppe and forest-steppe edaphoclimatic zones through the introduction of modern resource-saving technologies, varieties and breeds, as well as the realization of base and certified seed material of grains, industrial and forage crops. The land area of the Institute of Agriculture of Steppe zone of NAAS experimental facility is 11.0 thousand hectares, 10.3 thousand hectares of which are agriculturally used areas, including 9.7 thousand hectares of farm fields.

The Scientist of the Institute of Agriculture of Steppe zone of NAAS provide scientific-advisory support for innovation transfer in subordinate research enterprises. Relations between the scientific institution and subordinate research enterprises are built on a contractual basis and directed to the implementation of scientific research programs.

To ensure the sowing of spring crops in the leading agricultural enterprises in 2018, the scientific institution and research enterprises of the network have provided production and realization of basic and certified seeds: 615 tons of spring barley, 38 tons of spring wheat, 15 tons of peas, 90 tons of soybeans, 7 tons of buckwheat, 4 tons of coriander, 91 tons corn and 14 tons of sunflower. For the 2019 harvest, the Institute of Agriculture of Steppe zone of NAAS sold the basic seeds of new and promising winter crops of domestic selection: wheat - 714 tons, barley - 233 tons, rape - 2 tons. In addition, certified seeds were sold: winter wheat - 857 tons, winter barley - 297 tons, winter rape - 2.5 tons.

Conclusions

Performance analysis of the agricultural enterprises of the Kirovohrad region proves that a stable financial and economic position are among those who implement innovative solutions in their activities and constantly or quite often apply scientific achievement in the production of agricultural products. In the vast majority of cases, these are rather large agricultural enterprises which carry out updates of the basic production assets and annually update the variety assortment of cultivated crops.

Under escalating competition in the global market of agricultural products and goods for agroindustrial production, the continuous large-scale application of innovative solution is a key aspect in promotion of individual enterprises competitiveness, as well as the central region and Ukraine as a whole. The application of innovations ensures sustainable economic growth, enhances production and social development of society, guarantees economic security and stability.

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