UDC 001. 895 : 330.341.1 : 631.145

The Project of the Bioenergetic Agroecosystems Science Park

O. A. Kozachenko

The Institute of Water Problems and Melioration, NAAS
37, Vasylkivska Str., Kyiv, Ukraine 03022

e-mail: info@agroresources.com.ua

Received on August 8, 2014

A great number of novel Ukrainian technologies are used by industrial and commercial structures with the violation of intellectual property rights of their authors. There are about 10 managers per one promising scientific idea in the developed countries, while this proportion is inverse for Ukraine: on average there is one manager per ten ideas. As a result less than 4 % of Ukrainian enterprises are active innovation-wise and over 80 % of scientific and technical products are non-demanded. This situation is conditioned by the development specificities of the domestic market economy, based on trade and financial transactions instead of research intensity of the production. The current state of things does not meet the requirements of the innovation-driven growth and makes wide use of modern scientific achievement in the agriculture impossible. **Aim.** To study current problems of introducing the promising technological solutions into the agriculture. To recommend the mechanism of transferring scientific research results into production using the example of Bioenergetic Agroecosystems pilot project. To suggest the scheme of coordinating the interests of economic entities while introducing scientific research results into the production**. Methods.** The following approaches were used to achieve the abovementioned aims: abstract and logical method, synthesis, analysis, and induction methods. **Results**. Financial, economic, and legal aspects of the innovation market were considered. Based on the domestic and foreign analogues of establishing the existing science parks, the mechanism of transferring scientific research and development in the agrarian science into production was presented. The Bioenergetic Agroecosystems pilot project was used to suggest the industrial and organizational structure of the science park. The scheme of coordinating the interests of scientific research institutions, the agricultural producers and the state in the development of the market of innovation products in the agrarian sector of economy was elaborated. **Conclusions.** The realization of novel scientific decisions in the production should be provided by the following means: operating mechanisms of their stimulation on the state level, the improvement in the qualification level of scientists towards the transfer of scientific research and development and the elaboration of the communication infrastructure in the information support of the industry. The creation of a science park is the way of uniting the scientific and industrial potential into the single system of efficient ecological land use and the example of solving economic, ecological and social issues.

Key words: science park, bioenergetic agroecosystems, introduction of scientific research and development.

INTRODUCTION

The success of every economic system is considerably dependent on the mechanism, uniting the development of scientific ideas, the application-oriented product and the application of the result in the production. There are just a few economic entities in modern Ukrainian economy which are involved in the innovative entrepreneur activity in the full scale. This situation is conditioned by the complexity of acceptance and practical transfer to the innovative economic system after long years of forced re-distribution of industrial resources.

The agricultural industry is supported with powerful scientific potential of the National Academy of Agrarian Sciences of Ukraine, which coordinates fundamental scientific research in solving the problems of the agroindustrial complex. For instance, in 2013 1,300 fundamental studies were completed, 217 of which were presented for further introduction into production;

1,231 applied scientific products were developed, 540 of which were directed into production [1]. At the same time the agricultural enterprises of different ownership types have limited financial and economic possibilities, which narrows down the improvement of technological operations of the production of agricultural products, the upgrade of material and technical resources, and the introduction of innovations into production. In 2011 26.8 % of enterprises, specialized in crop cultivation, and 57.3 % of enterprises, working in cattle breeding, earned net profit (revenue) from the sale of agricultural products, amounting up to UAH 1 million [2]. At the same time the average prices of selling the new equipment to Ukrainian agricultural enterprises in 2011, for combine harvesters, in particular, were as follows: Don – UAH 741,6 thousand; Case – 1239,1; Claas – 1644,7; John Deere – 1652,1 [3]. The abovementioned figures testify to financial inability of economic entities to introduce scientific research products into practice on their own, as it would require additional costs. The analysis of literature and statistical data testifies to the presence of problems in the introduction of scientific research products into production. Less than 4 % of Ukrainian enterprises are innovationally active (whereas in the developed Western countries these enterprises are 60–80 %) and over 80 % of scientific and technical products are not demanded [4].

MATERIALS AND METHODS

General scientific methods were used to analyze the reasons of the current situation with the introduction of scientific research products into production, the experience of other countries was studied, and the model of organizational and industrial structure of the science park was elaborated on the generalized example of zonal models of Bioenergetic Agroecosystems [5, 6]. The mechanism of coordinating the interests of the participants of the process of introducing innovations was suggested.

RESULTS AND DISCUSSION

It was revealed that the current situation is conditioned by the development specificities of the domestic market economy, based on trade and financial transactions instead of research intensity of the production. It does not meet the requirements of the innovative development and makes the accumulation of modern scientific achievements impossible.

At present some of the most efficient mechanisms of realizing this process in the world are different innovative structures, science parks, first of all. Our country is only at the initial stage of this process. Ukrainian technology parks, the first of which appeared in 1999, are too far from the classic examples, although all the legal grounds were officially created to develop the economy towards the introduction of innovations [7]. The current status of legal support gives many preferences to the development of the innovative business, but, according to the data of Transparency International Ukraine on the protection of intellectual property rights, Ukraine is ranked the 60th in the rating of 60 countries; the number of permits, required for the start of business is 8; the economy of Ukraine is ranked the 137th by the economic freedom index. The World Bank called Ukraine the country with the highest number of taxes for business (135 different taxes); the second place was given to Romania (113 taxes), and the third one – to Jamaica (72 taxes). In the European countries this index does not exceed 10 [4]. Due to this situation for the last 22 years the number of researchers in the field of technical sciences decreased 3.5 times (with the 5.6-fold increase in their number in the political sciences, and the 3.5-fold increase – in the legal field); the familiarization with the new kinds of equipment decreased 14.3 times; the sectoral research is practically destroyed completely (only 20 out of 220 organizations still remain) [7].

Generally, domestic science parks do not have the industrial zone (all the participants should implement their projects using their own sites) and none of them is interested in establishing small science-oriented enterprises. As of the beginning of 2010, there were 17 projects of technology parks with valid certificates, 5 of them were registered in the framework of the Kyivska Polytechnika science park, 3 – in the Institute of Single Crystals and 3 – in Semiconductor Technologies and Materials, Optoelectronics and Sensor Equipment, the rest of science parks had one project each. There are no such entities in the agricultural sphere [7, 8].

Conceptually, a science park is an agreement-based association of economic entities, established by the principle of uniting the possibilities of education, science, production and business due to the coordination of implementing innovative projects of the science park by the partner participants. The formation of the science park is a more global undertaking compared to the implementation of a specific scientific product and a unique platform, considering the interests of all the potential partners. The commercialization of a specific scientific idea may be a starting point for the involvement of a great number of scientific institutions and enterprises of the agrarian sphere, and at the same time it

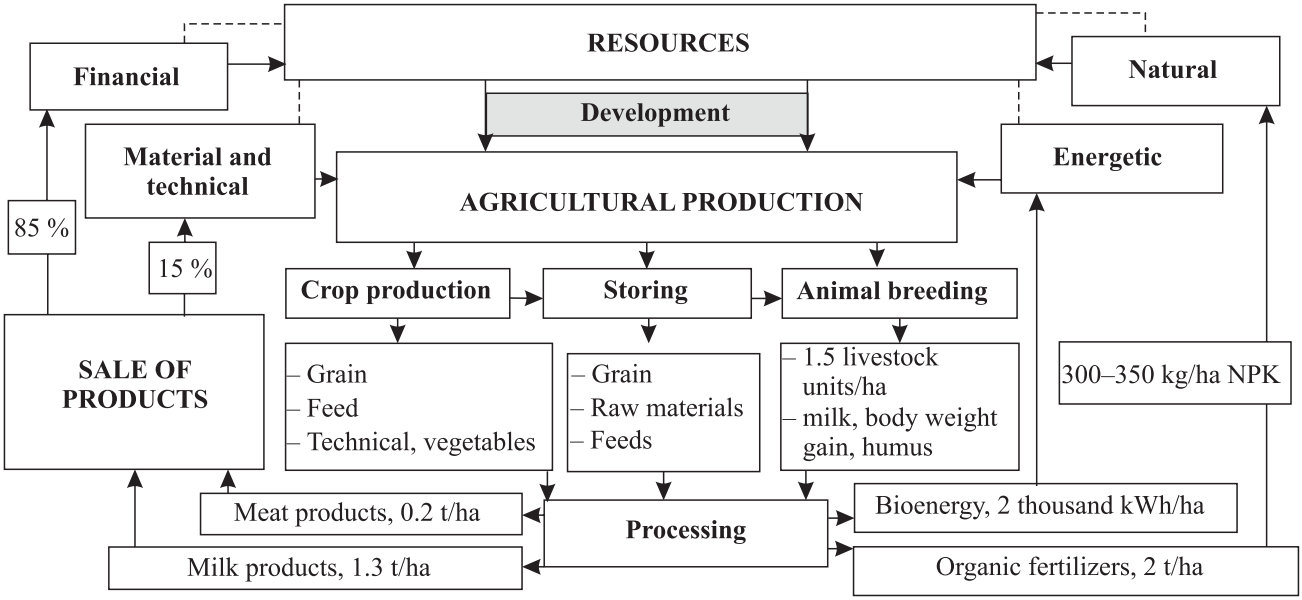

Fig. 1. Production structure of Bioenergetic Agroecosystems science park start-up project

may be a remarkable object of capital investment for the local authorities and other investors.

The example may be found in the scientific development of Bioenergetic Agroecosystems [5] which could receive the status of a Start-up project and actually become the platform to unite the best scientific achievements of the agrarian science, the material and technical resources of agricultural producers, the processing enterprises, as well as logistic and trade companies. The model idea of creating closed-cycle agroecosystems consists in transferring to the balanced production of bioenergy and high quality food products on the basis of organic farming agriculture. The practical implementation of similar products became possible due to

Table 1. General characteristics of Bioenergetic Agroecosystems science park project*

Position	Characteristics
Aims	Organization of ecologically balanced production of food products and bioenergy based on high level of recirculation of biogenic elements
Tasks	– Bringing the density of animals up to the level of 1.5 livestock units/ha; – production of finished meat and milk products in the amounts of 1−1.4 t/ha; liquid fuel – 150−200 l/ha, methane − 1.5−2 thousand m3/ha; – extensive renewal of soil fertility; – increase of the employment rate in agriculture by 45% compared to merely farming specialization; – decrease in greenhouse gas emissions by 0.7–0.8 t/ha from the current level; – transfer to the system of organic production with the obtaining of certified products
Market segment	– Organic production market; – market of biogenesis of energy; – market of quotas for greenhouse gas emissions; – green tourism; – market of innovations
Material and technical resources	To be determined with the consideration of specific conditions of agricultural enterprises–project participants
Production structure	See Fig. 1
Organizational structure	See Table 2

*Elaborated by the author.

current development of new processing technologies of different productivity levels.

According to the European practice, the application and submission of a project for approval requires the formulation of its main aim, organization and production structure, sphere of activity, necessary resources, etc. The following stage is the formation of business plans, based on the composed project. According to the data of American specialists, the establishment and implementation of a medium-size science park in the USA requires at least 10–12 million dollars [8].

A summarized model of a start-up project of Bioenergetic Agroecosystems science park is presented in Table 1.

Supposing the agricultural complex is created using novel technological products of industrial enterprises, its production infrastructure should include the following blocks: farming agriculture (crop production), elevator reservoirs, warehouses of feeds, production of animal products, processing modules (for crop products, animal products and affiliated goods) (Fig. 1). The incorporation of industrial constituents into a single production structure starts with the evaluation of agroresource potential of the territory, when the most productive plant cultivars and animal species are defined with the selection of technologies of their cultivation and processing. The process of substantiation and the elaboration of recommendations regarding the production are provided by the scientific institutions of the corresponding fields. The biomass, obtained in the crop production is used in animal breeding (dairy breeding) and transformed into 0.15 t/ha of meat, up to 1.3 t/ha of finished milk products (30 % cream, cheese) and up to 20 t/ha of livestock waste. Both livestock waste and garden waste (20 % of silage, hay, straw) are converted into methane on the biogas unit (up to 2 thousand m^3) and biohumus (up to 2 t/ha) [5]. Along with the received organic fertilizer the soil gets the compensating dosage of organic carbon and almost all the mineral macro- and microelements return therein, thus ensuring the renewal of the main natural resource – the soil layer. With some time a high level of recirculation of biogenic elements, sterilization of all the wastes from the harmful organisms and elimination of the seeds of weeds in the process of gas generation allows transferring to the grounds of organic production with the corresponding advantages on the markets of the obtained products. It also allows compensating the expenses of industrial energy resources in crop production, in the blocks of storing and processing the products with the corresponding economic advantages (green tariff). Therefore, after the implementation

Table 2. The main organization components of Bioenergetic Agroecosystems science park project*

Organization structure components	Functions
Administrative and directing center	Ensures the functioning of the whole complex as a single body. The governing bodies of the Science park are the general meeting of the founders; the president of the Science park; the supervisory board; the executive directorate, headed by the director (regular staff of 12).
Science-information-consultative center	Forms the project of bioenergetic production. Organizes competitive selection of client companies, for this reason forms the collegiate body, similar to the scientific and technical (expert) board, which analyzes the applications thoroughly, provides qualified consultative aid to clients of the park with the help of the research center personnel. Is the source of technical ideas, developments, inventions, implemented by the companies – park clients, and, to a considerable degree, is the supplier of staff for these companies and for the management of the park. Consists of the fundamental and applied research department, financial and economic department, project management and marketing department, legal department, patent department, etc.
Innovation business-incubator	An agricultural enterprise (or several enterprises), whose territory is leased for the stipulated period by newly-created small innovative enterprises-clients, which are provided financial, material and technical, informational resources, consulting and maintenance services for the commercialization of the results of scientific research and their transfer to the market of innovative products.
Industrial enterprises and companies	Transform the scientific potential of the research center into the products for market. Suppliers of processing modules for food products, gas generating equipment, elevator equipment, warehouses, equipment of animal production units and other components of material and technical resources.

*Elaborated by the author.

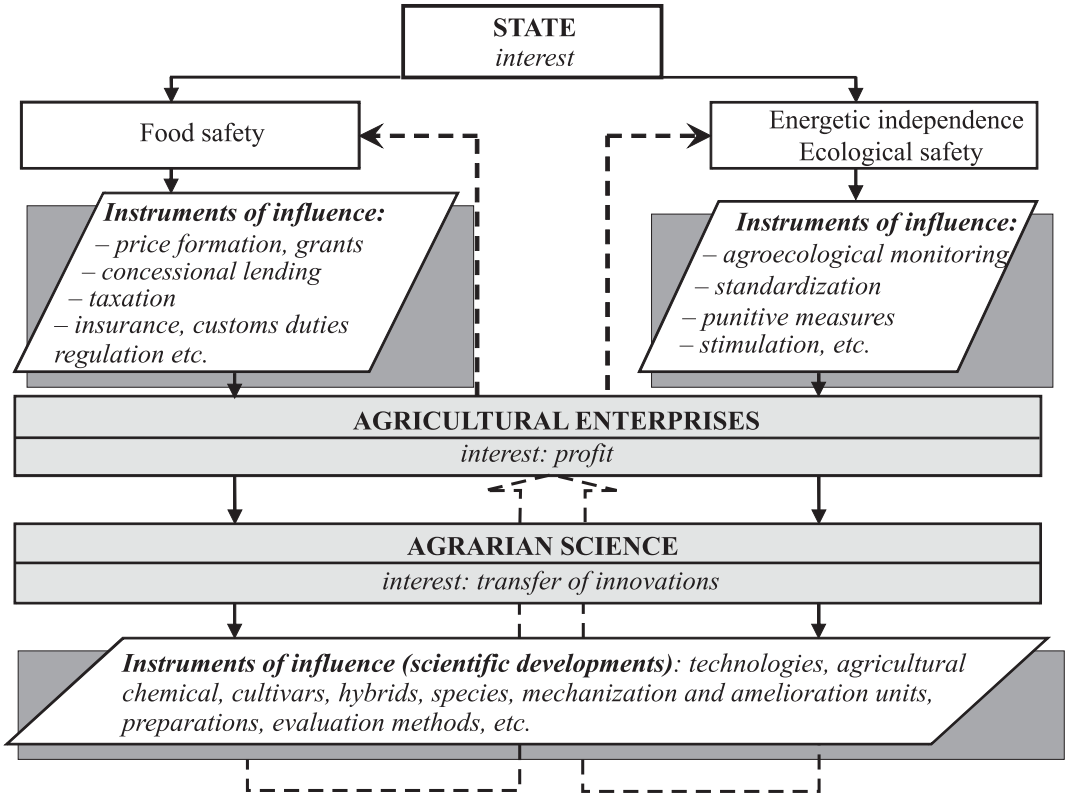

Fig. 2. The scheme of coordinating the interests of economic entities while introducing scientific research results into the production

of the infrastructure, presented in Figure the operating production expenses will mostly be limited to the expenses for payroll, seeds, amortization allowances, operating maintenance, which will allow reaching the average profitability ratio of 312 % [5].

The organizational structure of Bioenergetic Agroecosystems project is formed on the basis of high level intersectoral optimization of the agricultural enterprise (Table 2), including scientific research institutions, elaborating the technologies of cultivating field crops, optimizing technological processes in animal breeding, processing and storing the obtained products. The project of bioenergetic production involves necessary industrial enterprises for the establishment of planned infrastructure while obtaining predicted amounts of products. The coordination of the work in the science park is performed by the administrative and directing center, the personnel of which consists of specialists, experienced in specific subject matter, and managers.

The elaborated project will be further used to select partners, potential investors and other participants, which will allow developing a business plan on the basis of available joint material and technical resources for further consideration of the government, donor and other sponsor organizations regarding the provision of required finances to implement the project.

The promotion of producers' interest in the introduction of innovative scientific developments in general, and Bioenergetic Agroecosystems project, in particular, should be ensured by the active mechanisms of their stimulation on the state level with the consideration of the basic market "law of demand" on quality food products. The conditions of efficient manufacturing of agricultural products should be provided via such instruments as governmental grants, price formation, concessional lending, customs duties regulation, taxation, insurance which are regulation controls on the state level (Fig. 2). It would direct producers towards the familiarization with the most progressive technologies to ensure the competitiveness of the products obtained and high level of food safety of the state.

At the same time the instruments of monitoring over expenses, punitive measures, bonus payments and other controlling, economic and legal measures would be used by the state to promote rational use of resources, natural resources, in particular. In its turn, it would stimulate production structure for wide practical appli-

cation of scientific achievements, not demanded up till now.

CONCLUSIONS

The suggested mechanism of transferring scientific achievements into production, using the example of Bioenergetic Agroecosystems pilot project, is the way to unite scientific and industrial potential into the single system of efficient ecological use of land. It would become the example of solving economic, ecological and social issues. In particular, it would allow bringing the production of finished meat and milk products up to 1−1.4 t/ha; liquid fuel − up to 150−200 l/ha, methane − up to 1.5−2 thousand m^3/ha; conducting extensive renewal of soil fertility; increasing the employment rate in agriculture by 45 % compared to merely crop production; decreasing the greenhouse gas emission by 0.7−0.8 t/ha; transferring to the system of organic production with the obtaining of certified products.

Проект наукового парку
«Біоенергетичні агроекосистеми»

О. А. Козаченко

e-mail: info@agroresources.com.ua

Інститут водних проблем і меліорації НААН
Вул. Васильківська, 37, Київ, Україна, 03022

Значну частину нових українських технологій виробничі та комерційні структури використовують з порушенням прав на інтелектуальну власність їхніх розробників. У розвинених країнах на кожну перспективну наукову ідею в середньому припадає близько 10 менеджерів, в Україні пропорції зворотні: у середньому на 10 ідей припадає один менеджер. У результаті менш ніж 4 % підприємств України є інноваційно активними і понад 80 % науково-технічної продукції лишаються незатребуваними. Така ситуація пов'язана із особливостями розвитку вітчизняної ринкової економіки, що ґрунтується не на наукомісткому виробництві, а на торговельно-фінансових операціях. Подібне положення не відповідає вимогам інноваційного розвитку і унеможливлює широке використання в аграрному виробництві сучасних наукових досягнень. **Мета.** Дослідити сучасні проблеми впровадження перспективних технологічних рішень у сільськогосподарське виробництво. На прикладі пілотного проекту «Біоенергетичні агроекосистеми» рекомендувати механізм трансферу наукових розробок у виробництво. Запропонувати схему узгодження інтересів суб'єктів господарювання при впровадженні наукових розробок у виробництво**. Методи.** Для виконання поставлених завдань використано такі підходи: абстрактно-логічний прийом, метод синтезу і аналізу, прийом індукції. **Результати.** Розглянуто фінансово-економічні, правові аспекти ринку інновацій. Згідно з вітчизняними і зарубіжними аналогами створення діючих науково-технічних парків представлено механізм трансферу наукових розробок аграрної науки у виробництво. На прикладі пілотного проекту «Біоенергетичні агроекосистеми» запропоновано виробничу та організаційну структуру наукового парку. Розроблено схему узгодження інтересів науково-дослідних установ, виробників сільськогосподарської продукції та держави для розвитку ринку інноваційної продукції в аграрному секторі економіки. **Висновки.** Реалізацію новітніх наукових рішень у виробництві потрібно забезпечити: діючими механізмами їхнього стимулювання на державному рівні, підвищенням рівня кваліфікації наукових кадрів у напрямку трансферу наукових розробок та розвитком комунікаційної інфраструктури з інформаційного забезпечення галузі. Створення наукового парку є способом об'єднання наукового і виробничого потенціалу в єдину систему ефективного екологічного землекористування та прикладом вирішення економічних, екологічних та соціальних питань.

Ключові слова: науковий парк, біоенергетичні агроекосистеми, впровадження наукових розробок.

Проект научного парка
«Биоэнергетические агроэкосистемы»

О. А. Козаченко

e-mail: info@agroresources.com.ua

Институт водных проблем и мелиорации НААН

Ул. Васильковская, 37, Киев, Украина, 03022

Значительная часть украинских новых технологий используется производственными и коммерческими структурами с нарушением прав на интеллектуальную собственность их разработчиков. В развитых странах на каждую перспективную научную идею в среднем приходится около 10 менеджеров, в Украине пропорции обратные: в среднем на 10 идей приходится один менеджер. В результате менее 4 % предприятий Украины являются инновационно активными и более 80 % научно-технической продукции остаются невостребованными. Такая ситуация связана с особенностями развития отечественной рыночной экономики, основанной не на наукоемком производстве, а на торгово-финансовых операциях. Подобное положение не соответствует требованиям инновационного развития и исключает широкое использование в аграрном производстве современных научных достижений. **Цель.** Исследовать современные проблемы внедрения перспективных технологических решений в сельскохозяйственное производство. На примере пилотного проекта «Биоэнергетические агроэкосистемы» представить механизм трансфера научных разработок в производство. Предложить схему согласования интересов субъектов хозяйствования при внедрении научных разработок в производство. **Методы.** Для выполнения поставленных

задач использованы следующие подходы: абстрактно-логический прием, метод синтеза и анализа, прием индукции. **Результаты.** Рассмотрены финансово-экономические и правовые аспекты рынка инноваций. Согласно отечественным и зарубежным аналогам создания действующих научно-технических парков представлен механизм трансфера научных разработок аграрной науки в производство. На примере пилотного проекта «Биоэнергетические агроэкосистемы» предложена производственная и организационная структура научного парка. Разработана схема согласования интересов научно-исследовательских учреждений, производителей сельскохозяйственной продукции и государства для развития рынка инновационной продукции в аграрном секторе экономики. **Выводы.** Реализацию новых научных решений в производстве нужно обеспечить: действующими механизмами их стимулирования на государственном уровне, повышением уровня квалификации научных кадров в направлении трансфера научных разработок и развитием коммуникационной инфраструктуры по информационному обеспечению отрасли. Создание научного парка является способом объединения научного и производственного потенциала в единую систему эффективного экологического землепользования и примером решения экономических, экологических и социальных вопросов.

Ключевые слова: научный парк, биоэнергетические агроэкосистемы, внедрение научных разработок.

REFERENCES

1. Annual Report of the National Academy of Agrarian Sciences of Ukraine for 2013. – Kyiv: Agricultural Science, 2014. – 526 p.
2. Agriculture of Ukraine in 2011. Statistical Yearbook. – Kyiv: State Statistics Service of Ukraine, 2012. – P. 53.
3. Product of agricultural technology. Technotorg. − Nikolayev, 2012 – 160 p.
4. Avdulov A. N., Kul'kin A. M. Science and technology parks, technopolitan regions and science. – Moscow: Nauka, 2005. – 166 p.
5. Bioenergy irrigated agro-ecosystem. Scientific and technological support for agricultural production (southern steppe of Ukraine) / Ed. Yu. Tarariko. – Kyiv: DIA, 2010. – 98 p.
6. Bio-organic farming systems in the area of drainage (Recommendations) // Ed. Yu. Tarariko. – Kyiv: DIA, 2014. – 216 p.
7. Fedorov V., Tsyhychko A., Boyko S. Favorable innovative climate is required // Economist. – 1996. – N 7. – P. 28–32.
8. Mazur A. A., Pustovoit S. V. Technological Parks of Ukraine: Figures, Facts, Problems // Nauka ta innovatsiyi. − 2013. − **9**, N 3. – P. 59−72.