



INNOVATIONS FINANCING IN THE AGRICULTURAL SECTOR

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ABSTRACT

The main goal of this research survey into the most topical innovative researches and technologies is firstly to analyze the main reasons and financial problems that limit innovations implementation in the agricultural sector and then to give propositions to attract foreign experience and increase innovations financial resources. Accordingly, the subject of this research is to consider the agricultural sector of Ukraine as a whole and agricultural enterprises in particular. The study has used analytical and comparative methods of implementation and innovations financing estimations during the research, and having regard to these methods there were field investment support inertness, innovations financing mechanisms imperfection determined, and also there were strict legislative base disorder and high level of innovations implementation risks found out. The analysis of financial resources has concluded that today the rigid, stable and transparent mechanism of innovation activities financial support has not been formed yet. It should be noted that in most of the cases, the financing of the innovation has chaotic, nonsystematic, residual character.

Keywords: agricultural, Ukraine economy, innovations financial resources, agricultural enterprises

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1. INTRODUCTION

It is possible to ensure stable, competitive and sustainable development of the agricultural enterprises only by implementing innovations into their activities. Innovative activity is a specific and risky sphere of investments, which demands considerable financial expenses, especially on the first stage of introduction. This is not always possible or achievable for a private company in any market field to finance even in economically developed countries. As for the agricultural enterprises, where significant attention is paid to efficiency in the use of natural, financial and labour resources, any innovative solutions must find targeted state support. The studies show that in international practice, the state itself finances advanced scientific-technical developments and the most important innovative projects for it.

Nowadays, realities require innovative ways of development from the agricultural sector of Ukraine economy that could be the main precondition of its efficiency increase. Because today the market transformation of the state economy has shifted its emphasis of economic development towards raw materials industries and collapse of productions containing scientific research, thus science resources become unclaimed, their expenses being unproductive are reduced and this leads to a decrease and collapse in scientific researches amounts. In such kind of situation, it is necessary to form adequate steps according to the market requirements state support mechanism based on innovative policy. This should be aimed at ensuring the synergetic effect of all innovative process subjects cooperation, especially in the sphere of the agricultural sector, that is responsible for national food supplies security.

2. LITERATURE REVIEW

The analysis of the literary resources concerning innovations implementations into the agricultural sphere determines the importance and actuality of this problem. The main legislative documents that are the ground for this direction is the Law about innovative activities and Strategy of the agricultural sector of economic development and growth for the period till 2020 year. These documents determine the main types of innovations and principals of innovative implementations financing. Besides this nowadays a lot of experts, scientists and practitioners indicate and stress on the important role of innovations in agricultural sector effectiveness increase. Thus, the separate questions of innovations were enlightened in works of Babenko (2017), who investigated regularity of the growth and IP? enterprises management of agricultural complex of Ukraine, Kucher (2017), who circumscribed the modern stage, problems and perspectives of agricultural investment projects implementations and their financing resources; Rudenko (2015), who researched the particularities of innovations implementation in all the agricultural enterprises' activities and others; Boyko et al. (2019) proved the feasibility of creating a network of wholesale food markets as an important condition for ensuring the economic security of producers and meeting the needs of consumers with quality food; Bulisheva (2015) investigated the improvement of recreational land use by zoning the respective territories, differentiating them and separating them from other lands. However, when taking into account the modern needs of agriculture, it is necessary to look for effective ways of their implementation in the agricultural sphere. In his articles, Beach (2016) analyzed

7 agricultural innovations, that could influence on world-ecology and ensure the effectiveness of products harvesting, and McClelland (2016) determined five of the solutions helping to support global growth of sustainable agriculture and food production. Works of the indicated experts are the scientific background for agricultural sector transformation on innovative growth and development were the main ways of field's innovation potential increase. Meanwhile, distinguishing of the main problems of innovative activities financing in the agricultural sector and looking for the ways of their solving require deeper scientific researches and investigations. It is these issues that this article is devoted to.

3. RESULTS

According to the Law of Ukraine “Innovative activities”, Innovations are newly created (established) and/or/ improved competitive technologies, products or services, and also organizational and technical solutions of productive administrative, commercial and other specifications that improve structure and quality of production noticeably and/or social sphere.

Ukrainian agricultural enterprises are constantly investing in new agricultural machinery and spare parts (Fig. 1)

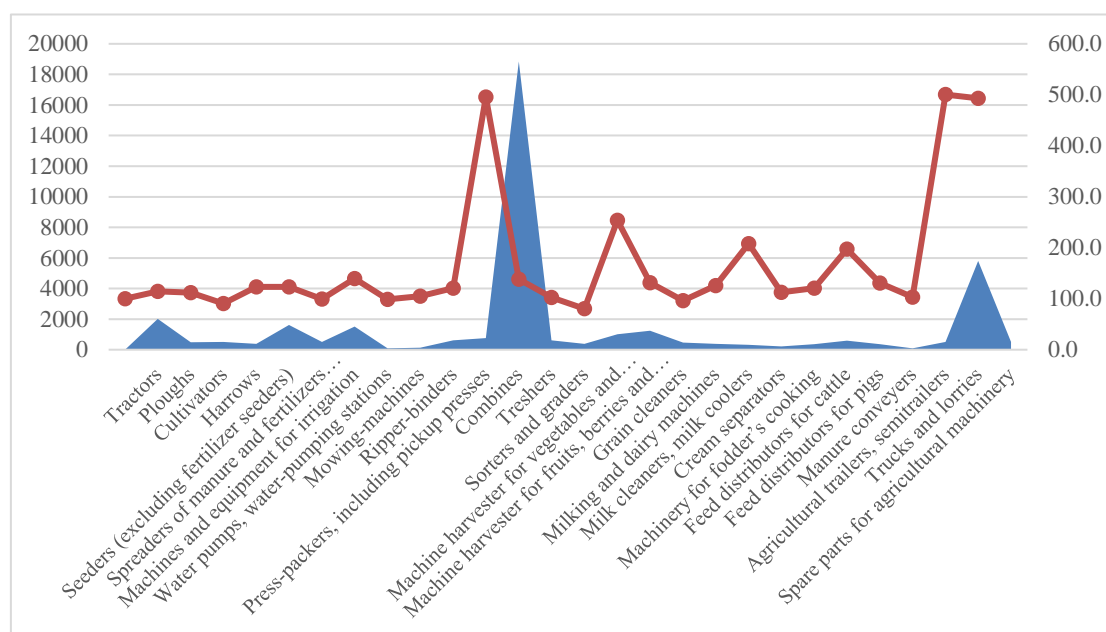


Figure 1 Purchase of new agricultural machinery and spare parts, trucks and lorries by capacity, types, and brands, by agricultural enterprises in 2018

One of the main conditions of strategic aims obtaining indicated in the "Development strategies of the agricultural sector of the economy for the period till the 2020 year", is its progress transferring to the innovative basis, the integral part of which is agricultural enterprises innovative projects implementation and their effective and productive management. As the scientists fairly point out the necessity of innovative projects implementation as a mechanism of systematic local development in the framework of separate agricultural enterprises is intensified by the presence of organizational and technological, productive and resource, social and economic, structural and informative problems of goods producers who require immediate solving. It should also be noted that, first of all, the effectiveness of innovative projects realization on agricultural enterprises depends on management actions correctness, the chosen management model and its successful practical implementation.

Taking into account, all above said, specific and more attentive attention should be paid to study of the modern stage of investment innovative projects implementation on the agricultural enterprises of Ukraine; it is necessary for finding existing problems, and in perspective to outline the ways of their solution (Kucher L., 2017).

In the 2015 year, Ukraine exported industrial goods and agricultural products for 14,5 bln. of US dollars. The competitiveness in the food world market on an adequate level requires new technologies implementation. Besides, the reason of innovation solutions use is a possibility of financial resources economy (for the account of implemented innovations in some processes) and activity effectiveness increase (for the account of more significant profit amount receiving). However, the technologies cannot substitute a person completely, but they do help decrease human factor influence on some of the processes. In Ukraine, most often innovative solutions are represented as workouts in the IT sector, and that assists in ensuring production growth dynamics using, for example, different elements of precision agriculture. Table 1 provided below shows the most up-to-date innovative workouts in the agricultural field that will be implemented in the future.

Table 1 Modern technologies analytics in the agriculture*

Technology	Characteristics	The end of the workout	Implementation
Genetically grown food	The creation of absolutely new subspecies and modifications of agricultural livestock and plants, with the expectations of receiving more qualitative human needs satisfaction. In comparison with genetically modified, genetically grown food will be created from the very beginning	2016	2021
Meat invitro	In vitro is possible –artificial meat, meat in a tube, or meat in a vial; i.e. meat that has never been a part of an animal. Nowadays, such type of meat in vitro is produced only for an experiment.	2017	2024
Agricultural robots	Agricultural robots – agbot – can be used for automated agrarian processes, such as harvesting or fruit harvesting, stiring, soil care, picking, planting, irrigation, etc.	2018	2020
Robotic farms	Hypothetically, this is the union of dozens or hundreds of agricultural robots, as well as thousands of microscopic sensors, which together will be able to monitor, forecast, grow harvest with minimal human participation. Such experiments are already being carried out but on a small scale.	2023	2026
Closed ecological systems	These are ecosystems that don't depend on external changes. Theoretically, such orders will be able to converse exhaust gases into oxygen, and also food and water. This will help supporting existence inside the system. On small scales such systems are being used, technological factors limit their full-scale usage	2015	2020
Vertical agriculture	This is a type of local agriculture. Vertical farms can grow plants or livestock in particular skyscrapers using greenhouses technologies and energy-efficient lighting.	2023	2027

Notes: * compiled based on Policy Horizons Canada (2013).

The implementation period modern technologies analytics is from 2 to 7 years, which is quite an average market (Fig. 2).

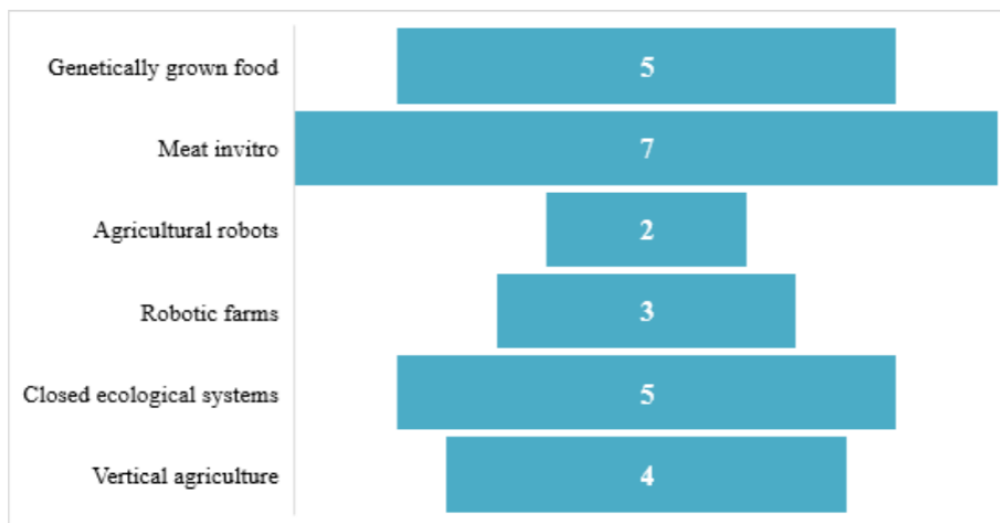


Figure 2 The implementation period of modern technologies analytics in the agriculture

Technological and innovative progress has been implementing so actively in the production processes that a lot of innovations, those active implementing and using were forecasted not earlier than the 2018 year, have been already working effectively. Among such innovations, there are air and earth sensors, which allow for the tracking of land plots, forests and water mass characteristics in the real timeframe, and also they can track biometric livestock indexes that allow following up and transmitting data about their condition in the real timeframe, and intellectual control system of resources exploitation helps economize seeds, minerals, fertilizers and herbicides consumption.

Some sensors prototypes track infrastructure condition just to control any changes in buildings, bridges, industrial sites, farms and any other infrastructural sites. In combination with intellectual networks, such sensors can immediately transmit information to relevant staff (brigades) or robots. Innovative products and workouts implementation into agricultural enterprises activities is a step to the creation of automated technologies with correct decisions making in agriculture; besides that, there is active engineering and agronomy integration into the precision agriculture.

Experts claim that investments in some elements of precision agriculture often are paid back within the first marketing year, and the indicators of enterprise activities efficiency can grow from 17 up to 45% (Brovynskaya M., Yurasov S., 2017).

Modern state-of-the-art methods of agricultural technologies optimization are represented by the following processes automation workouts: cattle feeding, food allowance balance system, that have a significant positive influence on-farm productivity increase, and also they are resented by the designed product-weather station for the agricultural sector, its system gives an estimation of real situation on the fields via weather conditions, agrarian products move control system, holdings security system, agricultural machinery unmanned management control system. AgroUA – is a phone application by its means agrarians can track the latest tendencies, events in the agricultural sector, find the required service or product, partners from different parts of the country.

Table 2 Mobile applications for agrarians of Ukrainian companies and distributors

Company	Application name	Specification of the application
Adama-Ukraine	ADAMALab	To identify diseases and pests
	Project form “Biotech LTD”	To collect data through a weather station
BASF	Financial agro-calculator	To analyze financial data and perform forecasting
DuPontPioneer Ukraine	«Agro-adviser»	To provide product information updated with a built-in filter, which facilitates the selection of a better hybrid, taking into account the objectives, technology and climatic conditions of the economy.
MobiMill	Products for such companies as “Bizon-Tech” and “Imperia-Agro”, “Agroscop”	For systematic climate information collection, weather condition a specific point, soil composition, microrelief
YaraInternational ASA	YaraCheckIT	It is used to determine nutrients deficit (shortage)
University of Wisconsin Integrated Pest Management	BeanCam	To give data about chlorophyll in soy leaves
StudioNoframe	FieldsAreaMeasure	It is used for geodetic surveys
QuartSoft Ltd	Soft.Farm.	It is used for reporting and fields analysis
ADOB Sp. z o.o. Sp. k.	Fertilizer2.0	It is used to determine problems with different elements of deficit
JSC «Elvorti»	“Elvorti”Apps	It ensures immediate access to product catalogue and all updated information without visiting the web-site

Despite the generally positive experience in these program software using on practice, there are still entrepreneurs who only closely examine mobile (phone) innovations, because novelties are not quite functional at the beginning and are quite sensitive especially concerning typical colour (for plant growing), the indexes and data can be average. Besides that, there is a tiny amount of small-size progressive farms in the structure of the Ukrainian market; there are more big ones that implement innovative systems (Sadova I., 2017).

If for big agricultural holdings such as, for example, Kernel, Myronovskyi Khiboproduct, Astarta, Singeta etc., the costs for new technologies implementation are purposeful, well-considered decisions, and sometimes these companies also contribute into their own technological workouts developments, and for small and middle-sized enterprises (farmers) minimal automated modules usage is quite expensive. At the same time, the lack of awareness of owners, agronomists, and other specialists on these enterprises about the innovative opportunities that are available on the market, and farmers reluctance to follow the rules applicable to proper land cultivation and the lack of state control over soil depletion and degradation, do not assist new solutions implementation into small and middle-sized enterprises work.

The problem of innovations investment is complicated also because it is required at the same time to look for new financing resources, work out effective schemes and mechanisms for financing and agricultural production innovative development ensuring even in terms of investment resources deficit. For ensuring continuous innovations investment in agricultural production, it is necessary to ensure this spectrum alternative multimodal investment sources that are complementary and can be simultaneously used (Fedun I., 2012).

Innovative solutions implementation support costs in enterprises activities take a significant part in the budget in foreign countries. The experience of these countries proves that in terms

of connected resources price increase within worldwide agricultural products price fall, modernization and production optimization are the main way for agricultural sector development (AgroPortal, 2017a).

As a kind of assistance, there was created a kind of sites for investments search into the agrarian projects, which are not connected with the banking system and state structures. For example, AgroTalks – a platform for agribusiness development, launched a unique for Ukraine Crowdfunding site – so-called Donate Agro at the end of last year. This site foresees different orientation agricultural projects hosting: from technological till social; a flexible model of financing that gives a possibility to receive the funds even if the financial aim of a company has not been achieved; and also attracting the attention of society to the problem that is solved by this project.

A sum of financial investments can start from 20 UAH and reach 1000-1500 UAH. In some cases, amounts can be larger in times: ten thousands of hryvnias or US dollars, but here a sponsor expects to receive a business share or product prototype. The team Invest Agro is responsible for the investments that are focused on agricultural startups development (selection, acceleration, investing) (AgroPortal, 2017b). There is activation seen in work of such web-sites as Crowdfunding and corporative incubators, such as Food-Focused Angel Funds, Foodshed, Paine & Partners Funds, "AngriHub" (New Zealand).

Also, there are agricultural food clusters created, which unite different market players. The examples of such clusters can be Health Valley and E-mobility Cleantech cluster. When enterprises choose a cluster model of cooperation, but not a separated production and then sales via traders, they save a lot of money. All the processes become more effective because goods produced in clusters are significant and clusters participants get a better price for stably big amount of products. And the production losses are less because here works a principal of big amounts economy. Small enterprises have an ability and chance to become more competitive, get more money; they get a chance to invest the funds into aggregate processing. They go to another level – they produce ready to use products, not only produce and sell raw materials that are cheaper. Here we can talk about products with added value (AgroPortal, 2017c).

There are more and more samples of successful serious investors financing and interest paid to innovative agricultural production growth and development. For instance, "OKKO Agrotrade" has begun agricultural workers financing for the next year harvest for the total amount of 1 milliard UAH, and next marketing year they plan to increase the volume of such financing till 3 milliards UAH. The proposed forwarding program is a unique complex product, which allows farmers obtaining fuel and fertilizers from "OKKO" petrol stations networks with a chance to pay grown plants for them after harvest. Risks insurance for the mutual trades will be taken by the insurance company "Universalna" that is part of one of the business-holdings of "Galnaftogas Concern" (petrol stations networks "OKKO"). In this case, a future harvest that is documented by a collateral agreement or agrarian payment voucher is a pledge. Wheat, barley, corn growing are being financed in the framework of the program, and in future, it is planned to include buckwheat, pea, and maybe other legumes or rape. According to the words of O. Nikolayenko, among the participants of the program, some farmers have land plots of 500 Hectares and who have several thousands of Hectares of land. European Bank of reconstruction and development will invest in the agricultural sector of Ukraine approximately €150-200 bln. in 2017. Aside from credit, the other aspects of EBRD support are anticipation in a dialogue concerning politics and agricultural sector ways of regulating, technical support providing and providing a platform for thought exchange regarding meat industry and milk sector functioning.

EBRD also supports the formation and strengthening of agricultural co-operative societies and self-governing institutes in different fields of the agricultural sector. More than ten the

richest people in the world including the creator of Microsoft Corporation Bill Gates announced about investment fund established with the amount of 1 milliard US dollars for financing projects concerning technologies development in the field of green energy production. This fund is going to invest funds into risky long-term projects for power technologies development that allow significant reducing greenhouses gases emissions into the atmosphere (Pomyanska N., 2016).

Thus taking into account all of the above, we can summarize the main challenges facing innovative financing in agriculture as follows:

- The huge and significant expenses for working out and implementation;
- The big amount of innovative products;
- The lack of information awareness among owners, agrarians, managers and other interested specialists of enterprises;
- Unsystematic land cultivation that doesn't require innovative products implementation (for saving resources, economy etc.);

Lack of control in soil depletion and degradation; the absence of competitiveness among innovative products creators;

The absence of innovators – specialists;

The absence of a systematic approach to small and middle-sized enterprises activities;

There is no state support.

In Table 3, it can be seen the primary innovation financing resources in the agricultural sector.

Table 3 Innovations financing resources in the agricultural sector

In foreign countries	In Ukraine
Business owner,	Business owners
Investment funds, business-angels	StartUp accelerators
Co-operative communities	Investment funds, business-angels
State programs	State programs (mostly via economic calculations of scientific institutions)
Scientific innovations support funds and SMP	European funds (programs Horizon 2020, European funds and other organizations)
StartUp accelerators	
Venture funds	

It should be noted that financing amounts in Ukraine are ten times smaller than abroad. In 2016 Ukrainian creators managed to attract about 130 bln. US dollars of investments at the number of accelerators and investment funds. The most active in the sphere of innovations workouts for the agricultural sector are such foreign companies, as Israel, the Netherlands, Denmark, Canada, USA etc.

Experience has shown that the most successful startups leave the country. They are tempted by world sales markets, "clever money", and huge possibilities for networking in worldwide centres of innovative business grow. In the best-case scenario, the teams of developers stay in Ukraine, but all the investments and company profit are transferred via legal entities – nonresidents. Estonia, Lithuania, Latvia, Poland, Canada at the state level, launch special programs for hundreds of millions of euros for attracting the best specialists, innovative entrepreneurs from Ukraine. Investors who finance state-of-art workouts within Ukraine very often they encounter some obstacles on their "way"; these being corruption, war conflict, currency constraints and capital constraints, and unstable legislation, and low purchasing power, and lack of confidence in the judiciary, unpredictable economic situation, and complex

tax administration, and weak prospects for the revival of economic growth, and unstable tax system, etc..

On the other hand, the state tries to support a foreign investor within the framework of legislative norms. Thus in October 2016, the government adopted in the first reading a bill on the abolition of compulsory state registration of foreign investment. Also, the law simplifies the regime of visiting the country by foreign investors, since registration of investments is an opaque bureaucratic obstacle for the realization of investor rights. Also, a foreign investor who is not an employee of the company has no right to visit Ukraine freely to control the terms of his business (Nekrasov V., 2017). This decision is an important point in supporting and attracting foreign sources of financing in the business environment of Ukraine.

4. CONCLUSIONS

The main finding of this research is that state support for innovations and innovative, newly equipped agricultural enterprises should be intensified. Also, a promising solution in the area of the possible use of innovations for "moderate money" is a co-operative partnership of enterprises in terms of advanced equipment leasing to each other, that is to say, sharing in the purchase or implementation activities, etc. After all, the quantitative assessment of the impact of various factors on the development of the agrarian sector involves the use of various software products and allows predicting and analyzing the annual impact of various solutions (including political ones) in the agrarian sector to the agricultural sector. Furthermore, the use of digital technology, a combination of continuous collection of field and meteorological data with agronomic modelling, allows us to form a coherent picture of the activity of both an individual enterprise and the agrarian sector as a whole.

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