

ECONOMICS OF DEVELOPMENT OF THE SEED-GROWING IN UKRAINE

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Abstract: *The analysis of the modern state and prospect of development of seed-grower is reflected in Ukraine. The ways of the decision of commercial turnover of seed and landing material and payments are offered for the use of intellectual property. Perspective ways are set for the acceleration of development of the organization of the market of seed and landing material of Ukraine. It is grounded to create a complete market infrastructure for plant varieties, all components of which would work in a harmonized economic mode and provide for the most effective realization of seeds and the distribution of risks in the process of its production and sale.*

It was shown, that the decision of the marked problems would give a possibility of adjusting of international cooperation of Ukraine in the field of the guard of rights on the sorts of plants and commercial turnover of seed and landing material. In order to increase the efficiency of the cereal seed industry, it is desirable that a regional seed system is established in each region.

Key words: *seed economy, seeds and planting material, seed-growing, plant varieties, seed market.*

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1. Introduction

The key to further development of the agro-industrial complex is the selection and cultivar upgrading, the creation of a national system of seed grain crops, capable of ensuring the full use of the available genetic potential of varieties of domestic breeding and the needs of agricultural producers in high-quality seed material.

This should ultimately help to increase crop yields, reduce production costs and increase the economic efficiency of production, strengthen the competitive position of both domestic seed production and agricultural complex of the country.

The further formation and development of domestic breeding and seed production, the output of domestic varieties on the international market, attracting foreign investments for the establishment of seed infrastructure that meets world standards and norms, is impossible without the introduction of seed certification in Ukraine, membership of our country in the Organization of Economic Cooperation and Development and accession to the schemes of varietal certification [8].

The study of foreign experience allows us to draw a parallel between the establishment of foreign multinational seed companies and the implementation of reform measures in the Ukrainian seed market. To do this, it is necessary to continue the research of the evolutionary development of seed production and the protection of rights to plant varieties of advanced foreign countries.

The high annual grain production in Ukraine at the level of 75-80 million tons can only be achieved by increasing the productivity of the main grain crops.

An essential component in ensuring productivity increase is the further harmonious development of the breeding and seeding sectors, and one of the main tasks of the latter is to bring domestic seed products to the level of world standards, increase its competitiveness and maximize the introduction of rice in Ukraine and, if possible, outside its borders.

According to the data of Ministry of Agrarian Policy and Food of Ukraine, it is necessary to have up to 2.5-3.0 million tons of high-quality seeds of various types of cereals only to ensure the sowing of arable lands in Ukraine, of which 1.5-1.8 million tons of winter and 1.0-1.2 million tons of spring cereals [6].

The potential supply in the seed and planting material market in Ukraine is always significantly different from actual sales. At that, it increases in proportion to the deterioration of the conditions for the sale of a certain variety of seeds.

Thus, the State Register of Plant Varieties suitable for Dissemination in Ukraine in 2018 includes more than 10.0 thousand varieties, hybrids, and plant lines, but only one-third of their number was sown for reproduction of varietal supplementary, basic and certified seeds.

For these purposes, about half of domestic and foreign breeding varieties are currently used in Ukraine [9].

Therefore, this state of seed development in Ukraine is relevant to its research, which led to the choice of theme for paper.

2. Materials and Methods

Methodological research basis is the dialectic method of knowledge, the system approach to studying the

economic basis of innovative development of the seed-growing in Ukraine. We have applied such methods as abstract-logical, theoretical generalization, system, and historical analysis, synthesis, monographic.

The required production volumes of seeds by the main types of crops were forecasted by seed's balance settlement and expert judgments based on the official statistical data.

Seeds classification is based on 2019 OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade [3].

The information base of this study is the official statistics of the State Statistics Service of Ukraine [4] and the Ministry of Agrarian Policy and Food of Ukraine [2].

3. State of Seed-Growing Development

The further development of domestic breeding and seed-growing, the output of domestic varieties on the international market, attracting foreign investments for the establishment of seed infrastructure that meets world requirements and norms, is impossible without the introduction of clear and understandable "rules of the game" in the market of seeds for its main the provision of legal and transparent intellectual property rights to breeders and breeding establishments and to determine the conditions for state support for breeding and seed-growing.

Despite the known economic difficulties, it was possible to preserve the priority of domestic selection for varieties of grain, leguminous and cereal crops.

Thus, in 2018, compared to 1991, the level of Ukrainian wheat selection reached 74%, barley - 57%. In addition, for such types of agricultural crops as fruits, berries

forage, and grapes it amounts to 83, 69 and 58% respectively.

On average, in all types of plants, the level of Ukrainian selection is 41%, with a total increase of 890 varieties in 1991 to 4341 in 2018 (Table 1).

Domestic grains of the group of grains, in comparison with foreign ones, are more resistant to drought and to germination in the ear. After all, they are created in the conditions of our soil-climatic zone; therefore, they are adapted to the conditions of Ukraine.

Such valuable features are very important for small farms, for which the importance is not transportability and appearance of commodity products, but its taste and resistance to diseases and pests. We also give our due to the foreign selection and we note that it has created many varieties with valuable features and properties.

For example, hybrids of sugar beet of foreign selection have a better form and chemical composition than the Ukrainian ones. In addition to the advantages of the chemical composition of root crops, foreign hybrids are often dominated by Ukrainian crop yields, sugar harvesting from one ha, and the quality of planting material.

The foreign seed has a high resemblance, germination energy, it is usually tear-downed, inlaid, well protected from pests and diseases. Also, the foreign seed of bioenergy crops are more productive and effective for biofuel production in the Ukrainian economy agrarian sector [1].

Along with its high productivity, foreign varieties have excellent technological qualities, which most manifest themselves in optimum conditions at home and under ideal conditions of cultivation in Ukraine.

But in complex soil-climatic, agro-technical and extreme weather conditions

of Ukraine, they not only do not have the advantages, but they can cause losses.

In contrast, sugar beet hybrids have a high bioavailability, exhibit resistance to

diseases a few times higher than foreign ones.

Table 1

Structure of species composition of Ukrainian varietal resources
(Source: compiled and calculated by the authors)

Culture	1991			2018			2018 to 1991
	Total number of varieties	of these of Ukraine selection	%	Total number of varieties	of these of Ukraine selection	%	
Winter	80	53	66.3	552	422	76.4	in 6,9 times
incl. wheat	40	32	80.0	428	315	73.6	in 10,7 times
Spring	189	121	64.0	3197	1170	36.6	in 16,9 times
incl. corn, without parent components	54	38	70.1	1240	388	31.3	in 23,0 times
Barley	21	13	61.9	164	93	56.7	in 7,8 times
Olive and spinach	65	37	56.9	2055	601	29.2	in 31,6 times
Fodder	214	165	77.1	455	316	69.5	in 2,1 times
Technical	33	24	72.7	274	56	20.4	in 8,3 times
Potato	37	22	59.5	150	72	48.0	in 4,1 times
Vegetables, melons, mushrooms	265	100	37.7	2517	690	27.4	in 9,5 times
Fruit and berry	370	199	53.8	465	387	83.2	in 1,3 times
Grape	93	34	36.6	50	29	58.0	in 0,5 times
Decorative, aromatic and medicinal	549	225	41.0	279	48	17.2	in 0,5 times
Total	1895	890	47.0	10543	4341	41.2	in 5,6 times

4. Needs Assessment on Varietal Resources

In our opinion, the further forming of varietal plant resources, primarily due to plant varieties of domestic breeding, needs to improve the mechanism of its legislative, organizational, scientific,

technical, technological, financial, personnel and other support.

For annual sowing in the range of 15-16 million hectares of grain crops, it is necessary to have about 3 million tons of seeds of new high-yield varieties and hybrids.

According to calculations (Table 2), it is

1.0-1.3 million tons of spring seeds, 1.7-2.0 million tons of seeds of winter cereals, including more than 2 thousand tons of feedstock, 500 thousand tons of basic and 2.5 million tons of certified seeds.

Table 2

Forecast of the required production volumes of seeds by main types of crops and categories in 2018-2020, this. tons rces
(Source: compiled and calculated by the authors)

Culture (Seeds)	pre-basic	basic	certified	Total
Winter and spring wheat	1.0	192.0	1061.0	1254.0
Spring barley	0.3	61.0	352.0	413.3
Winter barley	0.2	45.0	256.0	301.2
Legumes	0.6	201.0	834.0	1035.6
Total	2.1	499.0	2503.0	3004.1

First, it is necessary to overcome the negative trends in the creation of new varieties and hybrids, as close as possible to the needs of production.

At the same time, the most important problem was, there is and remains a complex resistance of domestic varieties to harmful diseases, especially viruses.

Having analyzed varieties of basic food plants for resistance to diseases and pests, scientists note that almost half of potatoes, one-third of winter wheat, 20 % of spring barley, half of pea, corn and sugar beets are unstable or relatively stable. No noticeable shifts in selection for drought tolerance and heat resistance are observed. The share of relatively stable varieties of winter wheat and sugar beet is almost half, for maize, spring barley and pea more than 60%.

Moreover, in the period of global warming, forces agricultural producers to more closely review their attitude to high-yielding, but not completely resistant to drought-tolerant varieties of plants of domestic selection. Significant activation requires the development of breeding hybrids. By this indicator, domestic breeders are behind the foreign ones.

Insufficient attention is paid to the research institutes of Ukraine selection of varieties whose products are intended for technical processing.

In fact, the creation of varieties of the rhizome, radish oilseed, castor, mustard, hemp, flax, and many vegetable crops, among which table beets, cabbage, cabbage, asparagus, and others.

Ukrainian livestock breeders of white and yellow and perennial grasses, especially alfalfa, white clover, hybrid clover, sainfoin and timothy trees, came out of sight of Ukrainian breeders.

Further growth of crop production is inextricably linked with the development of the seed industry, which fully implements the genetic potential of the formed varieties of vegetable resources. In the short term, the cultivation and production of seed material will be carried out on an industrial basis.

First, it concerns grain corn, sunflower, winter and rape, soybeans and a number of technical energy-saving crops. The above will enable us to satisfy the domestic demand for seeds and planting material and increase its export to foreign countries to EUR 1.3-2.0 million (Table 3).

Table 3

Potential annual cost of produced seeds of cereals and oilseeds in Ukraine, 2018
(Source: compiled and calculated by the authors)

Culture	Harvested land of seed crops [ths. ha]	Yield [t/ha]	Gross harvest [ths. tons]	Costs per one tone [EUR]	Total cost [mil. EUR]
Winter wheat	703.0	3.5	2460.5	249	612.7
Winter rye	41.5	2.0	83.0	233	19.3
Winter barley	120.0	3.0	360.0	233	83.9
Winter rapeseed	6.7	2.0	13.4	1556	20.9
Spring wheat	33.9	2.5	84.8	249	21.1
Spring barley	227.8	3.0	683.4	233	159.2
Buckwheat	34.3	1.0	34.3	1400	48.0
Bean	54.4	2.5	136.0	498	67.7
Corn	29.4	1.5	44.1	1089	48.0
Sunflower	33.4	1.0	33.4	3111	103.9
Soya	113.4	2.0	226.8	560	127.0
Total	1397.8	×	×	×	1311.8

The domestic branch of breeding and seed-growing is currently not in the best of times: the effectiveness of the state program for the formation and implementation of seed policies is very low and control in seed-growing through the constant reformation of the relevant bodies is insufficient.

As a result, there is an illicit trafficking in seeds of varieties of suspect origin unrecognized varieties or poor quality seeds. Official statistics on varietal seed and commodity crops are missing which makes it impossible to trace the use of intellectual property and royalties and accordingly taxes to the state treasury (the last statistical information on varieties was for 2006).

For 2013-2017 Ukraine imported the most seeds of corn and sunflower rice. The decline in imports occurred in 2015-2017 but gradually imports of these crops are increasing to pre-crisis 2014 (Figure 1).

The problem of providing domestic agricultural operators with hybrid corn sunflower and pea seeds remain unresolved.

Because of that in 2018, Ukraine imported 35.8 thousand tons of hybrid corn seeds as well as 29.9 thousand tons of sunflower seeds and 9.8 thousand tons of rapeseed [4].

Production of wheat seeds (over 50%), barley (16.9%) and soybeans (9.5%) have significant potential for export. Their share is three-quarters of the total.

For Ukraine which is an important producer and exporter of rapeseed corn and sunflower seeds, efforts should be made to increase the potential value of these crops.

At the same time only 1799 tons of wheat, 625 tons of rye, 234 tons of barley, 93 tons of buckwheat and 4439 tons of corn were exported in 2018 [4].

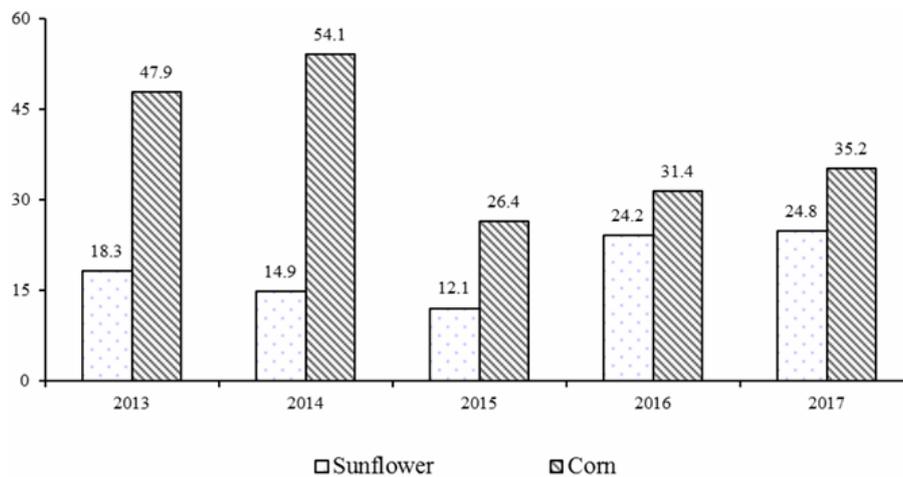


Fig. 1. *Dynamics of import of sunflower and corn seeds, ths. tons*
(Source: compiled and calculated by the authors)

5. Innovative Based Support System for the Development of Seed-Growing

The rapid development of socio-industrial and economic relations of the agro-industrial complex connected with the acquisition of Ukraine membership in the world trade organization and the need to build closer integration ties with the European Union requires continuous improvement and updating of organizational and technological solutions adapted to international standards, in particular in the field of seed and breeding achievements that determine scientific progress in crop production.

The support of breeders around the world is a rather acute topic. The same can be said about the use of legal intellectual property rights for domestic breeders.

If we analyze the implementation of the scientific institutions of the National Academy of Sciences of Ukraine and the National Academy of Sciences of Ukraine, the largest domestic breeding companies then we can note that we have a low level of sale of conditioned seeds.

The level of its sales is considerably inferior to the countries of the European Union. The average indicator for the EU countries is 50% (Table 4).

The experience of protecting intellectual property rights in leading countries of the world determines the main two key elements of making payments for its use:

- *Royalties (license fee)*. The amount levied upon the provision of a seed company license for the production and sale of plant varieties of plant species bearing legal protection. The payment is included in the amount of certified seed paid by the seed producer in accordance with the terms of the license agreement;
- *Farm Saved Seed (FSS) Selection Allowances*. Farmers pay for using for their own production of their crop yields derived from planted propagating material of the variety [8]. That is the national selection is able to receive additional financing for its development by sowing both conditioned and non-standard seeds of the same variety.

Certified seed using in the World
(Source: compiled by the authors based on OECD data)

Table 4

Country	%	Country	%	Country	%
Ukraine	5	Canada (Western)	18	USA (Plains)	20
Australia	10	Canada (Oriental)	40	USA (East)	50
Argentina	32	Mexico	89	USA (Pacific Northwest)	85
Great Britain	55	Netherlands	90	Uruguay	45
Denmark	75	Germany	43	France	55
Spain	20	Poland	15	Czech Republic	62
Italy	50			Sweden	80

According to their calculations from licensing, payments, breeders receive only 20%. These are breeding payments due to the use of Farm Saved Seed - seeds for their own needs [5].

The basis for the development of domestic breeding and seed-growing in the future is seen through the introduction of a mechanism for obtaining license payments on the basis of a real reflection of the use of the cost of seeds and garden material and their registration by an independent body of accounting supervision and control as well as support for national selection through the use of breeding payments for Farm Saved Seed (seeds for own needs) which are now used by commodity producers without the consent of breeders.

At the same time this mechanism has to be flexible for taking into account future needs as well as current ones; to encourage increased competitiveness of breeding and seed development; to ensure that added value is created for the entire chain to create a variety rewarded with successful results; to be effectively transparent, and not to leave a large administrative footing.

Summing up the production and sale of grain crops in Ukraine it can be noted that

despite significant improvements in the domestic market of seeds, our state is still far from other European countries to provide production crops with high quality conditioned seeds of higher categories and to meet their potential export opportunities.

This is a very alarming phenomenon that loses most domestic agriculture reducing its competitiveness in the European market.

The most innovative approaches to payment of licensing and breeding payments could provide an impetus for the development of breeding and seed-growing in Ukraine (Table 5).

For example, only the National Center for Seed Science (Selection-Genetic Institute) sells 12-13 thousand tons of conditioned seeds in a year which approximately gives about 0.3 million EUR of license payments (royalties) [10].

And for the use of Farm Saved Seed by producers seeds for the own needs of the breeds of the Selection-Genetic Institute it would have been necessary to pay another 10 million EUR selection payments.

Table 5

*Calculation of payment of licensed and breeding payments in Ukraine in 2017**(Source: compiled and calculated by the authors)*

Settlement (optional)		Paid	
Area of varietal crops	9.2 mil. ha	Area of crops for which royalties were paid	0.3 mil. ha
Breeding payments per one hectare	≥ 3 EUR	Licensed payments per one hectare	8 EUR
Amount to support selection	30 mil. EUR	Royalty collection	2.7 mil. EUR

6. Conclusions

Seed-growing in the future should develop along the market path in the conditions of creation and functioning of a civilized transparent state-regulated market turning of seeds and planting material and protection of intellectual rights of breeders and breeding establishments.

This requires:

- To improve the legal norms and aspects of the payment of royalties in Ukraine, taking into account the experience of their use in the EU countries and other advanced countries of the world;
- To introduce compulsory declaration of varieties of agricultural crops by agricultural producers who own agricultural land of 25 hectares or more (for a potato - from 10 hectares);
- To develop a clear mechanism for obtaining license payments based on a real reflection of the use of the value of seeds and seedlings using license and sublicense agreements and selective payments for Farm Saved Seed - seeds for their own needs and their registration by an independent accounting, oversight and control body;
- To increase the role of professional

non-governmental organizations of Ukraine in terms of registration of license agreements and royalties as well as control registration and introduction of seed and commodity crops in terms of varieties and hybrids;

- To increase the proceeds from payment of licensing and breeding payments for the production of new high-yielding and qualitative varieties of domestic breeding;
- To provide proof of payment of royalties and/or payments for FSS as a condition of state support for the cost of seeds/planting material;
- To develop a state program of development of domestic breeding and seed-growing.

The state regulation measures which will be an integral part of the plant varieties market mechanism are envisaged to be implemented solely due to changes in supply and demand.

The cheapest mechanism for regulating supply and demand is the self-regulating market equilibrium mechanism. All other activities require spending from the state and local budgets.

In order to create a full-fledged market environment, it is necessary to create market infrastructure in the regions to make and strengthen the wholesale trade in seed varieties.

The purpose of this is to enable seed producers and buyers to communicate normally, to select the best high yielding varieties, to finance their future costs.

An important measure of protection of property rights for plant varieties is the prohibition of any restrictions on the free movement of seeds and planting material throughout Ukraine.

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