

Plant selective breeding achievements: legal protection and intellectual property rights

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Abstract. Selective breeding achievement is a result of intellectual activity and at the same time a powerful means of production. Plant breeding and high culture of farming became the economic ground for emergence, development and existence of ancient and today's civilizations for many centuries. Contribution of plant breeders to tackle the problems of food production and other challenges is always both of economic and political relevance, hence, selective breeding achievements are considered strategic objects. As the population of the planet increases and the need for the environment preservation grows, the role of the breeding activity will play a central role. There is much concern for every country about the balance between the necessity to provide the population with food and sustain biological variety in today's global world. One of the ways to address the food issues and others is a genetic modification of living organisms including plant variety. Goals of the modern market of crop cultivation are to create adaptive breeds, which are resistant to biotic and abiotic stresses, can secure high and consistent harvest and are suitable for cultivation using resource saving technology, as well as food-supplying, technical and feeding orientation of the developed cultivars. At present, plant variety rights in most developed countries are completely excluded from the scope of patent law and are attributed to *sui generis* right. The authors' research on plant variety rights from civil perspective allows for in-depth study of the character of the object.

1 Introduction

This approach is an effective legal mechanism to protect intellectual property rights of breeders. New varieties are deemed as advanced production that are recognized as special items of intellectual property in most countries of the world. National breeding programs lie at the core of food security of the country, thus, the government should facilitate the improvement of selective breeding institutions. Recognition of plant breeders' rights as a type of intellectual property and the rights to it included in Part IV of Civil Code of Russia «Rights to the results of intellectual activity and means of identification», introduced in 2008, implies that legislation on breeders' rights is subject to the general principles of the civil law. It is difficult to overstate this fact, since it is of extreme importance not only for protection

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of breeders' rights as a strategic object in Russia, but also worldwide. Study of plant variety rights from civil perspective makes it possible to scrutinize the character of the object, identify similarities with other intellectual products as well as unique features. All things considered, the new (civil) approach to study the intellectual property rights to plant variety is an efficient legal tool for improvement of their protection in Russia.

The major feature of the legal protection of plant breeding products is two state registers. One registers cultivars under protection, and the other registers both protectable and non-protectable, but authorized for use.

Problems related to legal regulation of creation, use and protection of plant breeders' rights and intellectual property specifics were not the matter of a separate study. The problems under study are due to the fact that the Civil Code of Russia defines cultivar and plant variety primarily as biological objects distinguishing genotype or a combination of genotypes of the group of plants, which determine the feature of those. In other words, a new variety, regardless of its protectability, is defined with the combination of genetically derived morphological and biological traits that distinguish it from other varieties of the same botanical taxon, and there is enough difference in one feature.

Special questions on the matter of intellectual rights to plant variety have been chosen in other works [1-5]. The authors of this paper have also looked into the subject of intellectual property [6-7].

2 Materials and methods

The study is based on the provisions of international treaties of Russia, internal regulations of the Russian Federation, statistical data of state authorities.

Current work aims at comprehensive study of legal specifics regarding creation, use and protection of plant breeders' rights in order to improve the protection of intellectual rights to them on the example of plant varieties.

In order to achieve the target goal, there are formulated and tackled the following **objectives**:

- study of the legal framework of categories and concepts in the field of selective breeding;
- study of the contemporary state and trends in legislation in the field of selective breeding at the national level in Russia and at the international level;
- recognition of the relationship between the level of development of breeding science, increasing the yield of plant varieties and the number of breeding achievements included in the State Register;
- development of proposals aimed at improving the current legislation of Russia in the field of protection of intellectual rights for plant selective breeding.

3 Results

In recent years, Russian agricultural production has shown steady growth (table 1, figure 1). In particular, in 2017, the grain harvest amounted to 113.2 million tons, which is lower than the record harvest in 2017, but exceeds the average annual production over the previous five years (110.8 million tons). In terms of gross yield and crop production area (table 2) (without maize), the top three crops are wheat, barley and oats (figure 2).

Total grain requirements for food and forage in the Russian market amounts to 72-75 million tons a year. Estimating the gross grain yield in recent years, Russia is capable to compensate its losses without import. A quarter of Russian grain is exported. The Ministry of Agriculture of Russia prepared a long-term strategy for development of grain complex of

Russia until 2035. Implementation of this strategy will allow maintaining the food security of the country at a high level, improve efficiency and technology advancement of enterprises of the grain complex, strengthen the country's position in the world market of grain and cereal products.

Table 1. Structure of agricultural production by type, % of total

	2014	2015	2016	2017	2018
Agricultural production including:	100	100	100	100	100
plant products	49.3	51.9	53.0	50.9	51.5
where:					
cereals and leguminous crops	17.2	18.5	20.2	19.6	18.5
oil seed and fruit	4.5	6.4	7.1	6.1	7.5
plants used for sugar production					
raw materials of plants	1.6	2.4	2.6	2.0	2.0
potato	0.0	0.0	0.0	0.0	0.0
vegetables	8.8	8.1	6.2	6.5	6.4
straw and fodder crops	9.2	8.7	8.4	9.0	8.7
fruit, berries, nuts	2.9	2.7	2.6	2.8	2.6
grapes	3.9	3.8	4.1	3.5	4.0
	0.3	0.3	0.4	0.5	0.4
livestock production	50.7	48.1	47.0	49.1	48.5

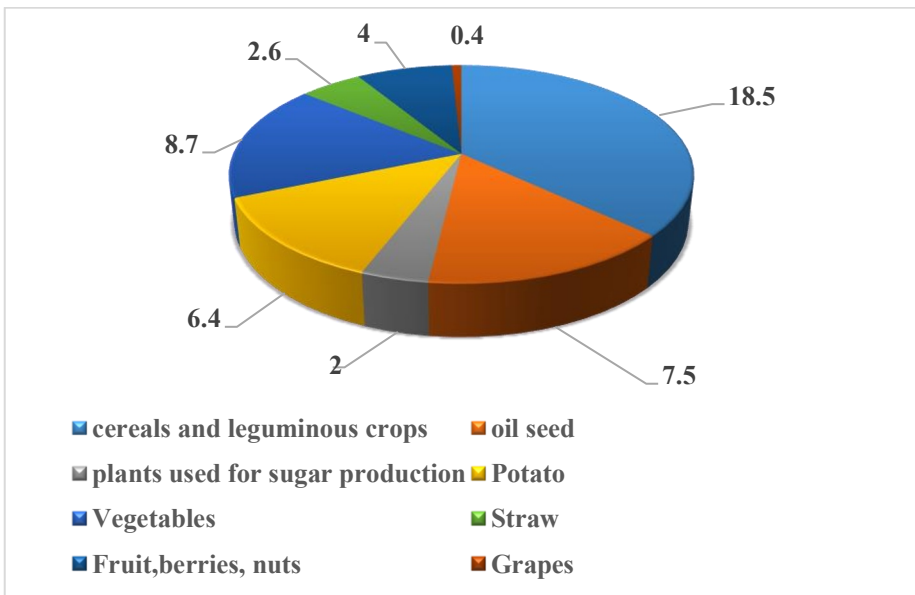


Fig. 1. Structure of agricultural production by type in 2018, % of total

Table 2. Key indicators of activity of agricultural companies

	2014	2015	2016	2017	2018
crop production area, million ha including:	55.3	55.1	54.7	54.4	53.6
cereals and leguminous crops	32.1	32.1	31.9	31.6	30.2
potatoes, melons and gourds	0.3	0.3	0.3	0.3	0.3
fodder crops	14.1	13.7	13.0	12.7	12.5

Production of agricultural products (horticulture), million tons					
including	77.6	76.2	86.2	95.0	79.5
grain	29.9	34.7	45.2	45.8	37.5
sugar beet	9.4	10.1	11.7	11.8	13.8
oil crops	3.8	4.7	4.2	4.2	4.3
potato	2.6	2.9	3.1	3.5	3.6
vegetables					

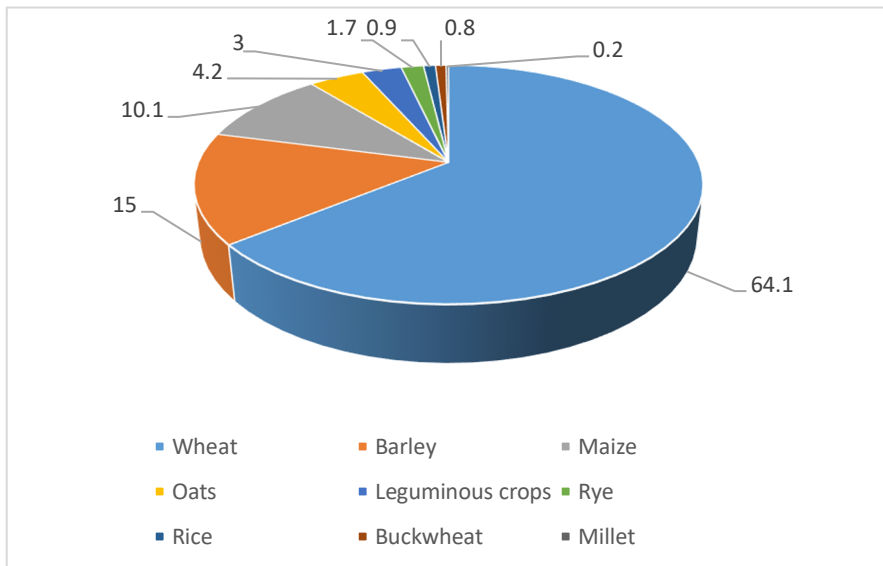


Fig. 2. Structure of grain production by type in 2018, % of total

According to the data of the State Register of Protectable Plant Breeding Achievements as of March 29, 2021, there is information on 368 genera and species of plants. In total, for plant varieties, the Federal State Budgetary Institution «GosSortCommission» (State Commission for Selection Achievements Test and Protection) received 14.754 applications for a patent: 1.540 applications were rejected or withdrawn by applicants and 2.162 applications are under examination. There were issued 11114 patents for plant varieties and 4999 patents expired. Table 3 demonstrates the progress on new selective breeding achievements for cereal crops within last five years. In 2018, the largest number of breeding achievements was recorded for maize, wheat and barley, but for 2014-2018 there is a noticeable decrease for wheat and barley (table 4). The share of foreign varieties of wheat, barley and oats is only 0.9-1.5%, and maize - 48%.

Table 3. Filling of applications and inclusion in registers

	2014	2015	2016	2017	2018	2019
Applications registered						
for authorization	2299	1902	1873	2002	1876	817
for protection	728	740	777	802	753	474
Included in register						
for authorization	1071	1998	858	1349	1225	1353
for protection	426	511	592	641	544	697

Table 4. Number of Selective Breeding achievements included in the State Register and authorized for use

	2014	2015	2016	2017	2018
Wheat	32	66	39	41	21
Rye	2	6	-	-	6
Barley	17	29	25	6	7
Oats	3	4	7	6	5
Grain maize	99	99	76	68	91
Millet	2	2	2	-	4
Buckwheat	2	-	-	1	3
Rice	5	3	5	6	4
Leguminous crops	10	15	22	9	10

Plant and seed breeding is the cornerstone to enhance the yield of cereal crops and improve resistance to negative influence of external factors. This can be seen from the experience of foreign countries that are leaders at crop-producing. For instance, plant and seed breeders of the UK boosted the wheat productivity by 50% in the second half of XX century. In Russia, the contribution of selective breeding to the enhancement of yield output over the past decades is estimated at 30-70%; while the negative climatic trend is increasing, the role of plant breeding will only grow. New varieties are deemed as advanced production that are recognized as special items of intellectual property in most counties of the world. In-vitro-based breeding makes it possible to increase inter-species hybridization, to preserve recombinants, and to obtain genetically different calluses from one plant (the somatic tissues of some plants have cells with variable chromosome number, etc.) to obtain biochemical and genome mutations, through meristematic tissue and cloning, to obtain virus-free material of valuable plants.

Plant breeders' rights comprise a number of specific rules that are more progressive than, for example, those in patent law. They are: the right to name the plant variety; liability [and right] of the originator; calculation of the term of validity of a patent from the date of registration of a breeding achievement; grant of a special document to the breeder confirming the right of paternity. The final goal of legal protection of any intellectual activity is its practical application or, as experts say, implementation. The achievements including breeding ones find their practical application only if they are useful.

4 Discussion

The authors have made the conclusion that plant and seed breeding play a significant role in accomplishing the goals for development of agricultural sector in Russia. According to many published data of foreign researchers (Thiede Gunther and others), a 50% increase in crop yields is ensured by the expansion of fertilizer use, 25% - by the improvement of machinery and technology for crop cultivation, 25% - in breeding and sorting. In the new economic relations, it is impossible to eliminate the trend of substitution of domestic varieties by foreign ones without reorganizing breeding activities. The current situation with selective breeding in Russia calls for better coordination, greater focus and higher qualification of the industry, more environmentally friendly breeding, introduction into the selective breeding process of raw material produced by molecular biology methods, increased emphasis on the promotion of new varieties as an indicator of the effectiveness of breeding science. It is required to accelerate the diffusion process of new varieties in production, which is going to provide conditions to phase out import.

Selective breeding institutions service considerably bigger areas than foreign colleagues. What is needed is an innovative concentration that strengthens breeding centers through the

diffusion of information technologies that reduce the distances between scientists, increase the speed and accuracy of estimation and extraction of valuable material. Breeding needs to be supported by modern biotechnological methods rather than substitution, which has become a trend. A so-called quantum leap can be achieved by concentrating on the subject, since plant breeding is a branch of agricultural industry as it produces seeds. The key criterion for the efficiency of its work is the coefficient of introduction of new varieties in production. This is what differs selective breeding from other fields of science and what was forgotten in recent years.

5 Conclusion

The authors have made the conclusion that plant and seed breeding play a significant role in accomplishing the goals for development of agricultural sector in Russia. As the result of studying the regulatory materials, scientific literature and practice on the protection of intellectual rights to a breeding achievement, as well as scrutiny of the object from civil-legal perspective, the authors have identified slight errors and gaps in the current version of the Civil Code of Russia, which obstruct to adequately exercise the protection of these rights. This also negatively affects general rate of development in selective breeding sector. First of all, the errors of the code concern the non-property rights of the originator, as the key figure on which the protection of all intellectual rights is based.

The authors have concluded that plant variety is a picture-perfect solution. It exists on a living material carrier of natural origin, together with it undergoes selective modification and is reproduced (self-replicated), but intellectual rights to it as such (cultivar), according to the general rule in force in the system of intellectual rights, are not associated with property rights to the carrier. Selective breeding solution can be in two forms: abstract («seeds» category) or specific («plant material»). There are only intellectual rights to the «seeds». Both the exclusive right of the patent holder (from the moment the object is created in a specific form and before its introduction into circulation, as well as in cases of its violation, and property rights) arise on the «plant material».

Plant variety rights is a comprehensive matter which encompasses the breeding product (cultivar), means of its individualization (naming) and the ability to accept genome structure.

Due to the complexity and integrity of breeding achievement, it is proposed to expand the scope of the right to use it by including in it actions related to its naming. It is suggested to add two extra conditions to the criterion framework and to give, on this ground, legal definitions of the concepts of «plant variety» and «breeding achievement».

Serious problems in protecting plant breeders' rights to the intellectual property result from the absence of any protection of new variety of plants since the moment those were created. According to the current provision, a selective breeding achievement becomes protectable after it is recorded in the State Register of Breeding Achievements. However, the right to obtain a patent established in the sui generis subsystem, the right to dispose of the right to obtain a patent, the right to name a selection achievement, the right to keep information about a new variety secret in the sui generis - these rights cannot arise and act, they are terminated by the entry into force of registration and granting a patent. A proposal has been made to expand the scope of protection of plant breeders' rights to include new varieties in the copyright and legal subsystem, so that the problem of «irrelevance» of contracts aimed at the creation of new varieties of plants can be resolved, they are now not protected as intellectual property and therefore not as civil rights. The authors propose to introduce the protection of new plant varieties as works of science.

In view of the fact that the right to protect the intellectual rights of a patented selection achievement arises after the registration of the object, it is proposed that this right be retroactive to cover the object from the moment of its creation. The authors believe that it

would then be possible to protect intellectual rights to a breeding achievement at any time of its existence, regardless of status. All things considered, a new plant variety, which initially existed in the status of «scientific work», is the same object, but with status of «plant breeding achievement», which is granted only after checking its protection in sui generis.

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