

How to Share Value in Seed Market?

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Abstract. As the Ministry of Agriculture is going to increase export revenues to 45 billion dollars by 2024, it has to be related with national research and development improvement (R&D). National breeding organization needs to harmonize budgetary and commercial funding through legal and economic approaches. Unique gene combination in one genotype, transfer from varieties to hybrids, production systems are common approaches to share value in seed business have been promoted mainly by global seed companies. Hybrid commercialization reduces the farms saved seed share, eliminates the risk of royalties loses. From 57 till 79% entries of rapeseed in national Registers of 9 countries are hybrids. The combination of target traits in one genotype proved to be effective in the commercialization of transgenic crops (GM), i.a. "stacks" - genotypes with two alien genes from unrelated species. The production system is an integral part of know how as a package offer of herbicide and tolerant genotype seeds, as well as consultations and digital solutions. Nowadays 24% of the rape acreage out of the 39 mln ha are planted with GM seeds. The third world seed market is controlled by market leaders: Bayer, which has acquired Monsanto, with total seed sales of \$ 10.6 billion, Corteva Agriscience (7.3 billion) and Syngenta (2.3 billion). Mergers and acquisitions of global players of agrochemicals and seeds market has reshaped agribusiness into the set of innovative approaches, databases and knowledge for breeding program development with a package offer of crop protection products, seeds and digital solutions.

1. Introduction

The transfer to modern efficient agriculture is one of the strategy priority of scientific and technological development of Russia until 2035. Within national project "international cooperation and export" the agriculture State funding will amount to 350 billion rubles for the next six years. According to the Ministry of agriculture plans export revenue will grow up to 45 billion dollars by 2024, i.a. 9.6 (21.3%) of oil and fat goods and 11.4 (25.3%) billion dollars of grain. Does national breeding programs and seed business meet modern challenges in conditions of insufficient R&D budget funding, and strong competitions with global seed companies?

Underestimation of investments in selection (budget financing) and creation of economic and legal conditions for market (extra-budgetary) financing significantly reduce the competitiveness of domestic agricultural science and create conditions for the spread of assortment of foreign companies with higher added value.

According to the Federal Custom Service information 85.7 Ktons of seeds totaling 24 139.4 million rubles by value were imported into the country in 2017 [1]. The article aim was to analyze the mecha-

nisms of sharing value extraction in the process of seed commercialization on the example of best practices.

2. Materials and methods

National seed registers of several Eurasian countries and open sources of information were used as materials. The methods have included economic-statistical, abstract-logical, graphic, regression, and expert assessments.

3. Results and discussion

Breeder and variety as outlet of his activity is the basis of the value chain "breeder – multiplier – farmer - logistics – trader – processor - consumer" (Fig.1)

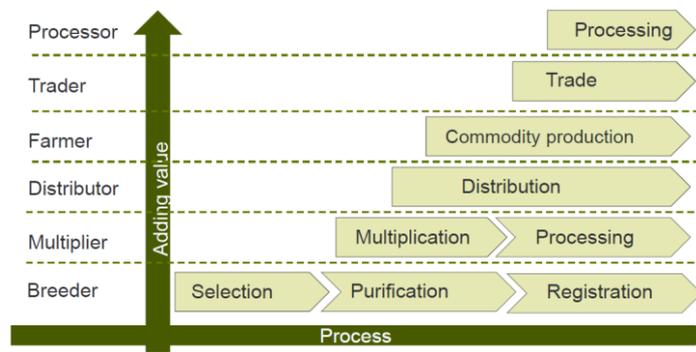


Figure 1. Wheat value chain: functions and processes.

Effectiveness of the subsequent links of the value chain in terms of creating added value of seeds by improvement variety adaptation, yield, quality, demand, unique properties etc. largely depends from the breeder product. National breeding program financing of the State R & D institutions is carried out at the expense of budgetary funds (which cover the researcher salaries cost), and extra-budgetary funds from seed sales and collection of royalties (had spent on the implementation of breeding programs, breeder bonuses) [2]. Domestic legislation does not support for the collection of farm saved seeds (FSS) royalties, the share of which exceeds 80-90%. Accordingly, 10-20% of seed are purchased on the market.

Crop acreage growth should be accompanied by a corresponding portfolio expansion by breeding institutions, only in case of return of investment into breeding programs. Domestic breeders are contracted by R&D institutions, as a rule, do not participate in the distribution of profits from the commercialization of bred by them varieties, which maintains an additional barrier for breeding program investment.

The active support of “localization” (varieties, seeds, machinery) is declared as one of the priorities of agricultural development. But breeding programs are more effective if seeds are commercialized on the base of proper business models and value sharing approach in the market economy. The goal is to ensure the economic interests of breeders, farmers as R&D good users and the state itself (Fig.2).

In order to ensure their economic interests, R&D institutions seek to expand their seed portfolio, taking into account the consumer needs with return of investment for breeding program. Each selected, but unclaimed variety means loose of circulated financial resources spent on breeding, and profit loose additional growth of financial resources as the profit expectation.

Referring to Ministry of Agriculture (MinAgro) data, applications of spring rape, i.a. 47 local breeders and 261 non-resident ones were submitted for the official testing within 2006 - 2018. During that period 13 local varieties and 249 alien ones, or totally 70% of submitted ones were rejected by MinAgro as their don't meet listing criteria, and did not populated with National Register. Consequently, the resources of the budgetary financing allocated to the for variety selection have been used

inefficiently. Taking in consideration fact, that the cost of a rape variety is about 4 million rubles, the country's budget has lost 52 million rubles.

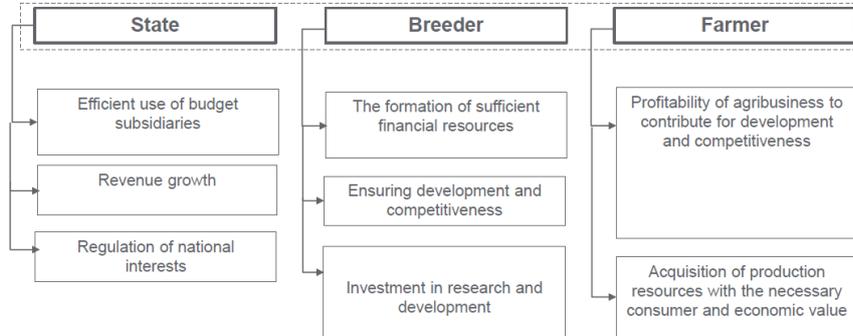


Figure 2. Economic interests of seed market players.

Referring to the MinAgro Order No. 43 dated 23 August 2018, an official testing cost for economic utility is 43 264.70 rubles per annum. Together with other services and MinAgro related with a variety tests in the Central Black Soil region (6 trial locations) requires about 300 thousand rubles per year or in conditions of two-season trials needs 600 thousand rubles. Since until 2018, the official trialing was free of charge for breeders (domestic and foreign), the budget losses for the tests are significant (157 million rubles.) Domestic breeders, being employed on contract base by public R & D organization, usually do not participate in the distribution of profits derived from the economic use of their varieties, which creates an additional barrier to investment of earned funds directly in R & D.

Positive impact of budget funding occurs when budget funds are directed to projects that, due to their social nature, are unfavorable for private business: in the social sphere (health, education, housing), in basic science, in infrastructure (roads, energy distribution systems). As the world practice shows, breeding activity is attractive for private investors only in the presence of legal and economic conditions of commercialization of its products (seeds). R & D as function has chance to be sustainable only if breeders have their own funds received not from the State, but through the royalty collection and from the seed sale, either through other ways. The supervisory functions of the State are aimed at total control structure, that provide money transfer to the budget, and does not support properly development of new enterprise.

Nowadays the return of investment into breeding programs through the royalty collection is not well adapted due to unclear legislative norms regulating the R & D activities. According to expert estimates, the existing budget financing of the public R & D institution provides only 50% of needed resources and does not sufficiently motivate researchers to achieve market economic indicators like the economic turnover growth (sales revenue) of scientific and technical results and the profit level too.

Despite fact, that the principles of the planned economy were rejected by the State, the R & D organization network have been maintained in ex-USSR, remains unchanged so far, been insufficiently adapted to the market conditions. The researcher effectiveness is still determined by the citation indices of their publications and number of listed varieties, but not by the marketing share bred by them varieties, or the market funding from their commercialization.

The main goal of domestic breeding programs should be extension of seed market share. It is highly necessary to review the current organizational and economic mechanism of breeding activities, to focus it on of commercial principle implementation, like sustainability, self-financing, personal interest and liability.

At its core, breeding activity, like any other, is interdependent production and economic processes. Almost all successful seed companies look for approaches to added value in process of their seed commercializing for better return of investment in R & D activities.

The main tools to share value from the seed commercialization, and in fact, the most useful agrarian innovations are combinations of unique traits into one genotype, transfer from conventional varieties to hybrids, and production systems.

Combinations of unique traits into one genotypes is actually the main goal of any breeding program. Well known in CIS winter wheat varieties Bezostaya 1 and Mironovskaya 808, had being planted on millions of hectares in the XX century, are the best example. A wide range of methods are used for the combination of interest genes in a single genotype: DNA sequencing, molecular markers, genetic platforms, climate chambers, genotyping, etc. Actually, that is also the goal of the genetic modification technology, and CRISPs (gene editing technology). Large-scale researches on rapeseed gene modification are carried out in a number of countries with a focus on resistance to herbicides, pests, drought, etc.

Share of "stacks" as genotypes with two alien traits from unrelated species, like herbicide tolerance and pest resistance is grown up for the last decade. [3]. GM rape is the third crop by acreage after soybean and corn in the world.

Hybrid systems are developed for reduction of farm saved seeds (FSS) share, and therefore, for enlargement of seed volume value. There is no risk don't receive royalties at the same time. Heterosis provokes yield growth due to gene pool interception with higher output on intensification (fertilizers, crop protection etc.) About 60% rape acreage are planted by hybrids in Australia, >80% one in Central and North Europe countries. According to ISAAA (International Service for the Acquisition of Agri-biotech Applications) About 24% of world rape acreage out of 39 m Ha are planted with GM-seeds [4]. All leading seed companies are invest in hybrid system development for main crops. Analysis of National Registers several countries has proved, that 57-79% listed entries are hybrids (fig. 3)

Production system is a set of technology elements as package offer, such as herbicide and tolerant seeds. Digital solutions, consulting support, and other services are often also a part of the offer. Tolerance to herbicides (glyphosate and glyphosinate) rape seeds dominate in North America (>80%) [5].

Rapeseed yield is going to grow up by 10-12% in the next five years due to the increase herbicide tolerant seed share. Many breeding programs are targeted on tolerance to herbicides with range of active ingredients: glufosinate, imidazolinones, 2,4-D, isoxazolone, dicamba, sulfonylureas, mesotrione and bromoxynil separately, on in combination [6-8]. Integral solutions as pack of seeds, herbicides and "know-how" are replicated around the world, with positive impact on sales and R&D investment in research and development.

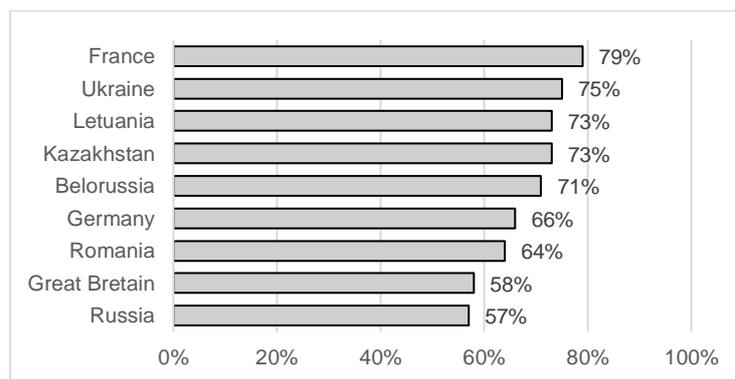


Figure 3. The hybrid shares in the rape National Lists of some Eurasian countries.

After mergers and acquisitions of last decade, the three largest corporations control a third of the global seed market: Bayer, which absorbed Monsanto, manage with 10.6 billion dollars seed sales, Corteva Agriscience (agricultural division of DuPontDow, which arose from the merger of DuPont Crop Protection, DuPont-Pioneer and Dow AgroSciences) with 7.3 billion, and Syngenta, which replaced the Swiss owners by Chinese ChemChina with 2.3 billion. About 10-15% their revenue are invested in R&D.

4. Conclusions

1. Agricultural innovations are the drivers of the global agribusiness transformation, leading to the reformatting of the market of agricultural technologies in the form of a combined offer of innovative approaches, databases, solutions, crop protection, seeds and digital solutions.

2. Global companies have been developing approaches to share adding value in process of their seed commercialization: a unique combination of traits in the genotypes, hybrid and production systems.

3. Competitiveness losing of national breeding programs is a consequence a lack of effective reforms at the network of research institutions, which has remained unchanged since the Soviet times and is poorly adapted to market conditions.

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