

## **CEREALS SEED LIFECYCLE**

Sergej V. GONCHAROV

Crop breeding Department, Voronezh State Agricultural University, 1 Michurin  
Str.,394087, Russian Federation

\*Corresponding author email: slogan1960@mail.ru

### **ABSTRACT**

Cereals seed lifecycle is considered as duration of a variety commercial use, or period of having margin from variety market introduction till its withdrawal from the market. In most of cases, it coincides with average period of variety listing. But available National Registers includes list of approved varieties, and don't keep tracks about withdrawal ones. The article goal was to check author's methodology of calculation of actual cereals seed lifecycle. National Registers of Commonwealth of Independent State (CIS) countries (Belarus, Kazakhstan, Russia, Ukraine) compare to German Bundesortenamt were used as data base. It was assumed that number of varieties, been listing within five years period, is constant; therefore share of listed varieties in older groups shows probability of a variety listing within any group. It was found, that winter wheat seed commercialization period lasts about 24 years in Kazakhstan, 14 in Russia, 13 in Germany, 12 in Ukraine and 9 in Belarus. Similar trends are calculated in other cereals (spring oat, spring wheat, spring barley, and winter rye). The higher yields are, the shorter variety lifecycle, the better seed exchange rate (certified seeds share), and even return of breeding investments. Seed lifecycle is under influence of such factors as average crop multiplication rate, seeding rate, crop margin, yields, operational risks, acreage, etc. Markets of high marginal crops with shorter seed lifecycle are attractive for international seed companies expansion.

**Keywords:** *CIS, national register, cereals, listing, seed lifecycle.*

### **INTRODUCTION**

The seeds business is reasonable to explore from the standpoint of marketing, i. e. as the lifecycle length of a product. The actual length of a product, or seed lifecycle is considered as duration of its commercial use, or period of having margin from a product market introduction (a variety registration) till its withdrawal from the market. Actually, it is length of listing an average variety period.

The shorter is lifecycle of a product, the faster market growth is, especially in the conditions of high competition on the seeds market, high input technologies, and profitable crop production. New generations of varieties with better adding value (greater yield potential, better quality and adaptation) are able to increase the profitability of the whole value chain from breeder till processor.

Fairness of the variety registration, patent protection and complicated certification have a direct impact on the pace of varieties flow in the National register and the duration of their lifecycle. The CIS countries and the EU ones have common approach to the protection of intellectual property of seeds due to UPOV rules, and the National registers populating schemes.

Comparison of lifecycle duration between field crops explains some details of crop competitiveness, attractiveness of markets for seed and other commercial products.

### MATERIALS AND METHODS

Updated data of the National Register of Belarus (BY), Germany (DE), Kazakhstan (KZ), Russian Federation (RU), and Ukraine(UA) of cereals in 2015 [National Register BY, 2015; Beschreibende Sortenliste. 2015; National Register KZ, 2015; National Register RU, 2015; National Register UA, 2015], been interpreted with the author's method of variety life cycle calculation (Goncharov, 2013) served as source for initial data. Also, official statistics of Russia and USDA, results of author's market researches, and market assumptions are used.

### RESULTS AND DISCUSSION

The National Register of breeding achievements admitted for use contains the list of registered varieties in the year of its publication. New registered varieties entered there, leaving ones from the market are excluded.

There were 296 winter wheat varieties from by 60 breeders are listed in the National Register of Russia in 2015. Direct count of varieties listed annually shows a dynamic range, which is insufficient for a variety lifecycle calculation (Figure 1). It is possible to count the number of varieties listed for example by 2001 in updated National Register, but it is unknown number of withdrawn ones, as tracks are not available.

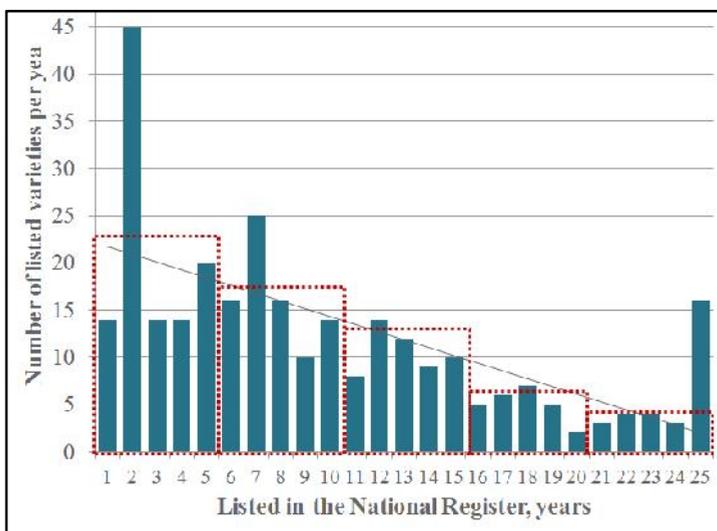


Fig. 1. Dynamic row of winter wheat varieties number with period of their listing

The oldest variety is Bezostaya 1, listed in 1959, Mironovskaya 808 (1963), and Mironovskaya Yubilejnaya (1970) were commercialized for 57, 52, and 46 years correspondingly. But they are exceptionally old; the majority of varieties listed much shorter. That period of time depends on legal patent expiration.

Let's make the assumption that, the number of varieties, listed within five years, is constant, and combines varieties over the past 30 years, released during the five-year period of time in the group. There are 36% listed varieties as "new" ones; they are up to 5 years old; 27% are commercialized within 6-10 years, 18% are used within 11-15 years and so on (Table 1).

Table 1. Calculation of a variety life cycle on winter wheat example, based on the National Register of Russian Federation, 2015

Period of varieties registration, years	Varieties number per group	Share of every group, %	Relative share compare to group $\leq$ 5 years	Populating in the group for a variety, years
$\leq 5$	107	36%	100%	5.0
6-10	81	27%	76%	3.8
11-15	53	18%	50%	2.5
16-20	25	8%	23%	1.2
20-25	17	6%	16%	0.8
$\geq 26$	13	4%	12%	0.6
Total	296	100%	-	13.8

It is logically, that all varieties not older 5 years will be listed in the National Register all 5 years long period. The varieties of the group 6-10 years old will be listed all the 5-years long period with probability 76%, or their input in life cycle is 3.8 years (5 years x 76%)(Figure 2). The varieties from the group 11-15 years old will be listed all 4 years period with probability 50%, or their input in life cycle is 2.5 years. Adding all probabilities will receive average life cycle of winter wheat variety in Russia (14 years). Similar procedures with other cereals varieties listed in the National registers demonstrate wide range of their commercial cereallifecycles (Figure 3) in Russian Federation.

Spring oat is a crop with the longest variety life cycle (25 years) in Russia compare with spring durum wheat for example. Oatacreagedomains in ornamental regions with low-input conditions (Middle Volga, Western and Eastern Siberia). Climate conditions have stronger effect on crop performance there, compare to genetics. Winter durum wheat is comparatively new crop at the introduction stage of the grain market without significant acreage. Therefore, winter durum varieties have been listed only last 15 years only in this country.

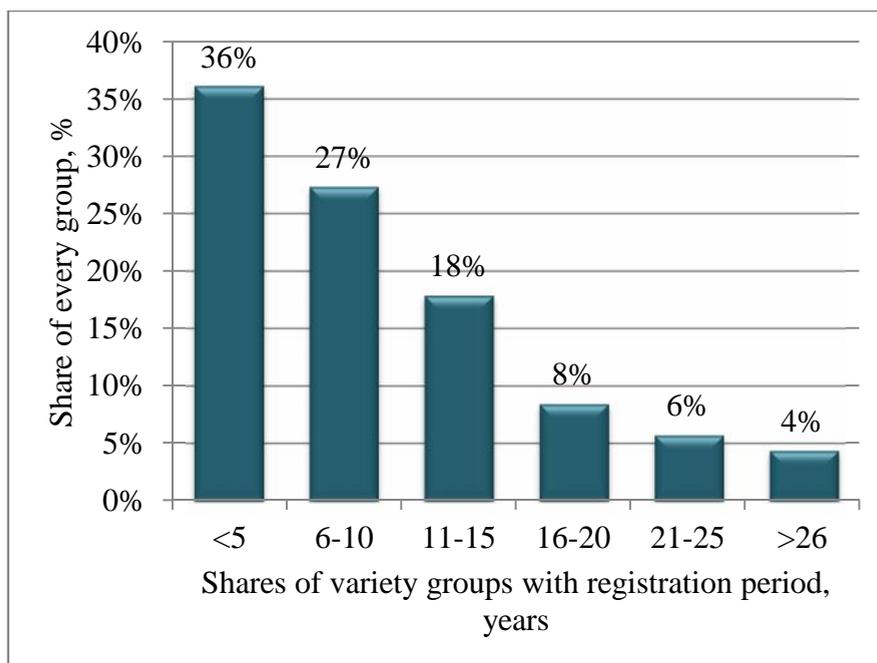


Fig. 2. Groups of winter wheat varieties with different period of their listing in the National Register

Acreage per crop, and acreage per variety in particular are other reasons for difference in lifecycles. Calculated by us cereal seed lifecycles are close to the results of Dr. Khalipsky assessment, who has reported about “length of registration period” such crops as winter rye (22. 6 years), oat (18. 1), common wheat (13. 6), and barley (12. 9) in Siberian part of country (Khalipsky, 2009).

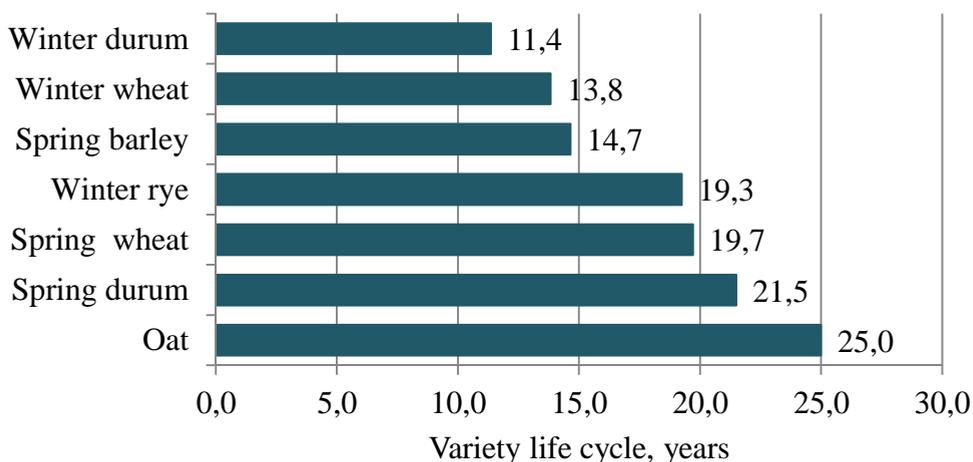


Fig. 3. Variety life cycle of cereals varieties in Russian Federation, 2015.

Calculated cereals seed lifecycle in other countries based on their national registers, showed, that periods of variety commercialization are longer in Russia and Kazakhstan, compare to Ukraine, Belorussia, and Germany (Figure 4). Surprisingly, seed lifecycles in last three countries are similar by duration, what's contradicts common opinion about faster seed commercialization rate in EU. For example, spring barley lifecycles have the same duration there (about 10 years) in DE, BY, and UA. There is no winter rye acreage in Kazakhstan, that's why no records there.

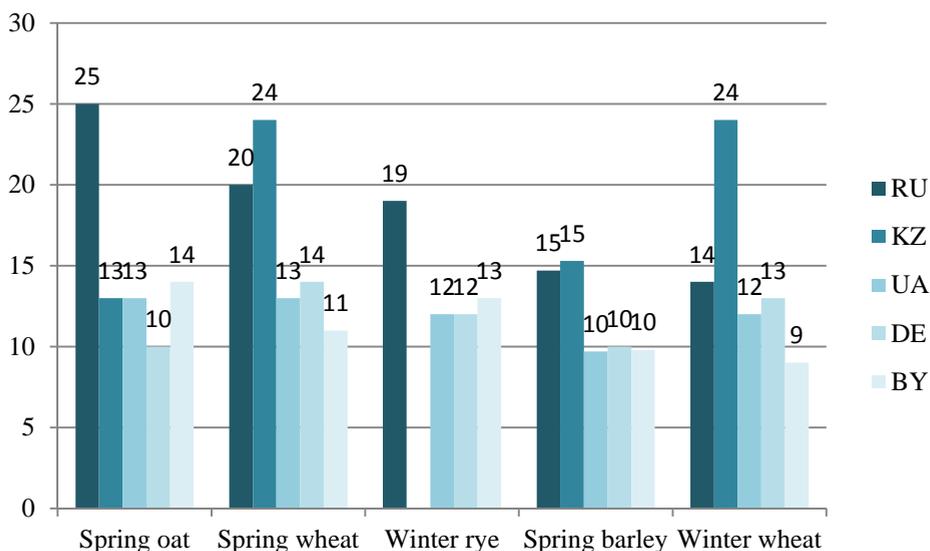


Fig. 4. Seed life cycles in CIS and Germany, 2015.

Spring wheat lifecycle in Kazakhstan lasts 24 years, what is more, than in Russian Federation (20 years), in Germany (14 years), Ukraine and Belarus (13 and 11 years correspondingly). But spring wheat acreage in Russia and Kazakhstan both is about 24 million hectares, what is insignificantly more compare to Germany, Ukraine and Belarus all together. There is no actual spring wheat breeding in Germany, but only facultative one, as it is insured crop to mitigate risks of winter kill. In the Republic of Kazakhstan variety of winter wheat on the average "lives" for 24 years, since there are about planted 200 thousand hectares of the crop only. Winter wheat lifecycle in Russia lasts 14 years, what is close to the performance of Germany (13 years) with acreage of 3.2 million ha, Ukraine (12 years) with 8 million hectares and Belarus (9 years) with 0.5 million ha.

Malting barley market has strong impact on reduction of seed lifecycle. Downstream demand of malting barley commodity from approved varieties leads by malteries, and breweries.

Seed lifecycles are affected by a number of factors, among them the most important are crop input, seeds exchange rate, planting rate, seed prices, and generations offered for sale, crop margin, and others (Figure 5).

Markets of high marginal crops with shorter seed lifecycle are attractive for international seed companies expansion. German seed companies (KWS, Saaten-Union, DSV etc. ) extend registration of their varieties to CIS countries. Cereals varieties flows come from Germany (country with advanced breeding programs) to CIS, but it is not happened in opposite direction (Figure 6).

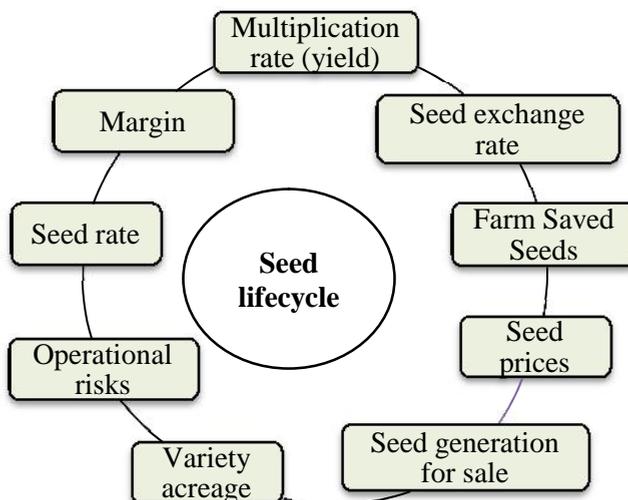


Fig. 5 Factors with the biggest affect to cereals seed lifecycle

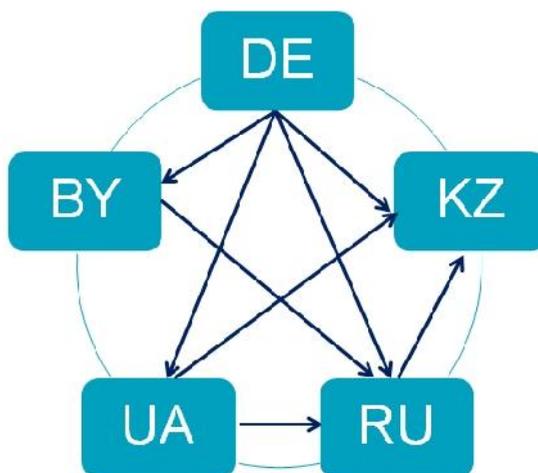


Fig. 6 Cereals seeds flow directions

In common cereals are losing competition with oil seeds, corn, sugar beet, and other crops with higher margin. But from point of crop ratio, cereals acreage will not be reduced radically, and will be stabilized, especially in “row materials zones” close to grain markets.

### CONCLUSIONS

Cereals seed lifecycle takes from 9 years (winter wheat in BY) till 25 ones (spring oat in RU). It is shorter in Belorussia, Germany, Ukraine compare to Russia and Kazakhstan. Cereals with higher input (winter wheat and spring barley) have shorter seed lifecycle compare to winter rye, spring wheat, and spring oat.

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