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Seed production system in Ukraine: Trends, challenges, and threats

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Abstract. The development of an effective seed production system in Ukraine is conditioned both by its key role in ensuring seed, food, and national security of the country and by the emergence of new challenges and threats that affect the functioning of the system and need to be countered to eliminate or mitigate their negative impact. The purpose of this study was to investigate the current trends in the functioning of the Ukrainian seed production system and to identify new challenges and threats to national interests. The methodological framework of this study included the dialectical

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method of scientific cognition, which was used to establish the relationship between the object of study, which is the seed production system of Ukraine, and events and phenomena occurring in nature and society that have a substantial impact on the object of the study. The methods of analysis and synthesis, systematic generalisation, and comparative analysis were also used. The study analysed the conditions of functioning of the breeding and seed production system in Ukraine and identified current trends that characterise its internal state. The study identified challenges and threats to the national seed production system that pose a threat to the seed, food, and national security of Ukraine. The study analysed destructive processes in the functioning of the national seed production system, which can lead to its degradation and destruction. Measures to overcome the consequences of the negative factors in the system of breeding and seed production in Ukraine were substantiated. The study scientifically substantiated the principal criteria for the development of an effective national seed production system. The study provided a reasoning for the need for long-term investment in breeding activities and identified priority areas of state support for the seed production system in Ukraine. The conclusions, proposals, and practical recommendations are of practical importance and can be used in the development of relevant programmes and measures aimed at supporting the development of seed production, specifically, breeding activities in Ukraine, and ensuring fair remuneration to breeders who are the authors of new productive crop varieties

Keywords: breeding; seeds and planting material; variety; seed security; sustainability; food security

INTRODUCTION

An effective seed production system is a crucial factor in increasing agricultural production and an additional source of income for farmers, as well as a prerequisite for food security. Considering the steady downward trend in the production of seeds of Ukrainian breeding of major crops caused by numerous problems that hinder the development of seed production in Ukraine, and in the context of global climate change and new challenges and threats associated with the consequences of the full-scale invasion of Russia, it is increasingly urgent to radically change the national seed production system, which should be not only effective, but also sustainable and dynamic.

L.H. Biliavska *et al.* (2020) point out that Ukrainian seed production has great reserves for further improving its efficiency. The researchers assume that the establishment of a seed production system in Ukraine will contribute to the growth of the national crop production potential and attract additional investments in the development of the breeding industry. An effective breeding and seed production system is a source of innovation. According to S.V. Mishchenko (2021), the development of a new paradigm for the development of the agro-industrial complex is possible only with the active and balanced introduction of innovations, including breeding and genetic ones.

K.V. Akulenko (2018) believes that the principal areas of breeding and genetic innovations in the agricultural sector of Ukraine may include new crop varieties with high potential productivity; renewable and environmentally friendly bioproducts; new crop varieties and hybrids with improved quality parameters; adaptation crops (development of varieties that are more adaptable to adverse weather conditions), etc. The seed production system involves the production of quality seeds and providing access to the results of breeding to agricultural producers. It should combine breeding activities,

variety testing, zoning of new varieties and their mass reproduction, variety maintenance, control over varietal (testing) and sowing (seed control) qualities of seeds, as well as variety renewal and variety replacement. A seed production system functions effectively if it ensures seed security, i.e., if there is sufficient access to the required amount of quality seeds and planting material of the desired crop varieties at all times, in both good and bad harvest seasons (FAO, 2016).

O.T. Westengen *et al.* (2023) argue that to be effective, seed production systems must perform three principal functions: variety development and management, seed production, and seed distribution. N.P. Louwaars and G. Manicad (2022) emphasise that any seed production system, whether formal (official) or informal (farmer-led), must be sustainable. A sustainable seed production system contributes to the sustainability of seed supply and demand in a given context, and thus to seed security. The researchers interpret the resilience of a seed production system as its ability to anticipate, absorb, respond to, or transform the changes that result from change. These changes can be in the form of threats or opportunities created by markets, the environment, and technology.

A sustainable seed production system is an essential element in the sustainability of agricultural and food production. A sustainable seed production system requires ensuring crop diversity and its conservation. At the same time, a sustainable seed production system is a prerequisite for achieving seed and food security. L. Batten *et al.* (2021) emphasise that a fundamental component of a sustainable food production system is crop genetic diversity, not only because it allows the system to recover from agricultural challenges such as environmental hazards, pests, and diseases, but also because crop seeds also carry genetic information – an indispensable resource for breeders and farmers

to develop new crop varieties. A prerequisite for the development of an effective seed production system is the search for criteria to ensure the efficiency of its functioning, as well as the identification of problems and opportunities for the development of the industry. J.L. Andrade-Piedra *et al.* (2020) believe that the effectiveness of the seed production system should be considered from the standpoint of the state, which is responsible for national food security and food price affordability; seed breeders and producers; farmers.

An efficiently functioning seed production system is a guarantee of the country's seed, food, and national security. It involves the fulfilment of the economic interests of all stakeholders, namely breeders, seed producers, and farmers. Ensuring fair remuneration for intellectual achievements of breeders, such as the creation of new high-yielding varieties, is a key condition for the development of breeding activities. That is why the purpose of this study was to assess the conditions for the functioning of the seed production system in Ukraine, identify problems that affect its development, and substantiate the development vectors for an effective seed production system, considering new challenges and threats.

MATERIALS AND METHODS

The theoretical framework for the investigation of the seed breeding and production system in Ukraine included the scientific studies of Ukrainian and foreign scientists. The sources of information are the data from the Register of certificates for sowing and commodity qualities of seeds of major crops in Ukraine for 2020-2023 (Register of certificates for sowing and commodity qualities of seeds, 2021-2023) provided by the Ministry of Agrarian Policy and Food of Ukraine and the results of the activities of research institutes of the National Academy of Agrarian Sciences (GMOs – good or harmful, 2021). The source of information on the legalisation of GMO crop varieties in Ukraine is the Law of Ukraine "On State Regulation of Genetic Engineering Activities and State Control over the Placement of Genetically Modified Organisms and Products on the Market" (2023). The study also employed information materials from the Seed Association of Ukraine (Seed Association of Ukraine, 2023), the Ukrainian Agrarian Council (UAC, 2023), as well as the results of research by the Centre for Food Safety (Centre for Food Safety, 2015) and the United Nations Food and Agriculture Organisation (FAO, 2016).

The study of the national system of breeding and seed production was based on the use of the dialectical method of cognition of reality to establish the cause-and-effect relationships of the elements of the system under study. The application of this method made it possible to carry out a systematic analysis of the processes and phenomena that directly affect the seed production system, considering their interdependencies

and interrelationships. The literature cited in this study was reviewed using such theoretical research methods as observation, abstraction, analysis, comparison, and generalisation. Using the comparison method, comparable and differing approaches, opinions, and practical recommendations for the development of the seed breeding system in Ukraine and other countries were identified.

A comparative analysis of the performance of the Ukrainian seed production system in 2020-2023 was used to identify cause-and-effect relationships in the Ukrainian seed breeding and production system, which involved in-depth investigation and generalisation of relevant facts and phenomena, establishment of trends in the development of this system and identification of current challenges and dangers. The objective historical method, as well as the methods of induction and generalisation, were used to establish regularities in individual facts and to generalise them, which helped to predict possible scenarios of events. The deductive method was used to identify challenges and threats to the functioning and development of the seed breeding system in Ukraine as a result of building a logical chain of reasoning based on general information and individual facts.

By applying formal-logical methods of cognition, primarily analysis, synthesis, analogy, and comparison, the conclusions of this study were formed. Based on the analysis of theoretical and empirical findings of the investigation of the seed production system in Ukraine in 2020-2023 and using the methods of analogy, comparison, and synthesis, the study summarised and systematised its key provisions, which formed the basis for the conclusions. Practical recommendations on the development vectors for an effective seed production system in Ukraine were proposed using the heuristic method of generating ideas for solving the problem.

RESULTS AND DISCUSSION

Increasing the productivity of crops in modern conditions is possible mainly due to genetic advantages resulting from breeding activities. S.V. Mishchenko (2021) substantiates the need for breeding development by the fact that a variety cannot exist forever, it degenerates due to mutations, loses adaptation to environmental conditions due to climate change, the spread of new pests, and the emergence of new strains of pathogens, and loses demand due to changes in production requirements for crops; this is caused by the fact that new discoveries are being made in biology generally and in genetics specifically.

The current challenges and threats to agricultural development in Ukraine, such as global climate change, land degradation and dehydration, pose new challenges to the seed breeding and production industry. According to S.P. Ivanyuta *et al.* (2020), climate change, together with other negative anthropogenic factors,

can lead to the expansion of risky farming and desertification in the southern regions of Ukraine. At the same time, the environmental situation in Ukraine is deteriorating due to Russia's military aggression. Large-scale soil contamination, erosion, and dehydration are exacerbating and accelerating climate change and negatively affecting agricultural production. The explosion of the Kakhovka Hydroelectric Power Plant was a global environmental disaster.

Under the current circumstances, it is critical to take measures to adapt to the changes that adversely affect Ukrainian agriculture. Among the priorities is the development of a productive and dynamic national system of breeding and seed production to produce crop varieties adapted to new growing conditions and provide them to agricultural producers. A modern seed production system must be sustainable and efficient, providing access to plant breeding results and a reliable supply of quality seeds. The availability of seeds and planting material of crop varieties desired by agricultural producers, adapted to local conditions and meeting their preferences, tastes, and expectations, in the required quantity and at any time, regardless of weather, anthropogenic, or any other negative factors, ensures seed security and is a vital condition for the development of the agri-food sector of Ukraine's economy.

Achieving such a state is possible not only with an efficiently functioning national seed production system. Therewith, the seed production system should meet the national interests of Ukraine, ensure food and national security, which implies protection from real and potential threats and dangers. The principal challenges and threats to Ukraine's seed production system today include the growing dependence of agricultural producers on foreign-bred seeds, which is not in Ukraine's interest and poses a threat to seed, food, and national security. Furthermore, the dominance of foreign breeding in Ukrainian agriculture can lead to the degradation and destruction of the national seed production system.

During the 1920s, the Ukrainian seed production system showed a steady trend towards an increase in the production of foreign-bred seeds and a corresponding decrease in Ukrainian seeds. Among the main groups of crops, the largest decline was in the production of seeds of Ukrainian grain breeding. Thus, in 2020, the production of winter wheat seeds of Ukrainian breeding totalled 93.6 thsd t, while in 2023 – 37.9 thsd t, i.e., the production volumes decreased by 59.5%. In 2023, the decrease in production of Ukrainian-bred spring and winter barley, maize, and winter rye seeds reached 80.3%, 76.2%, 50.6%, and 60%, respectively, compared to 2020 (Fig. 1).

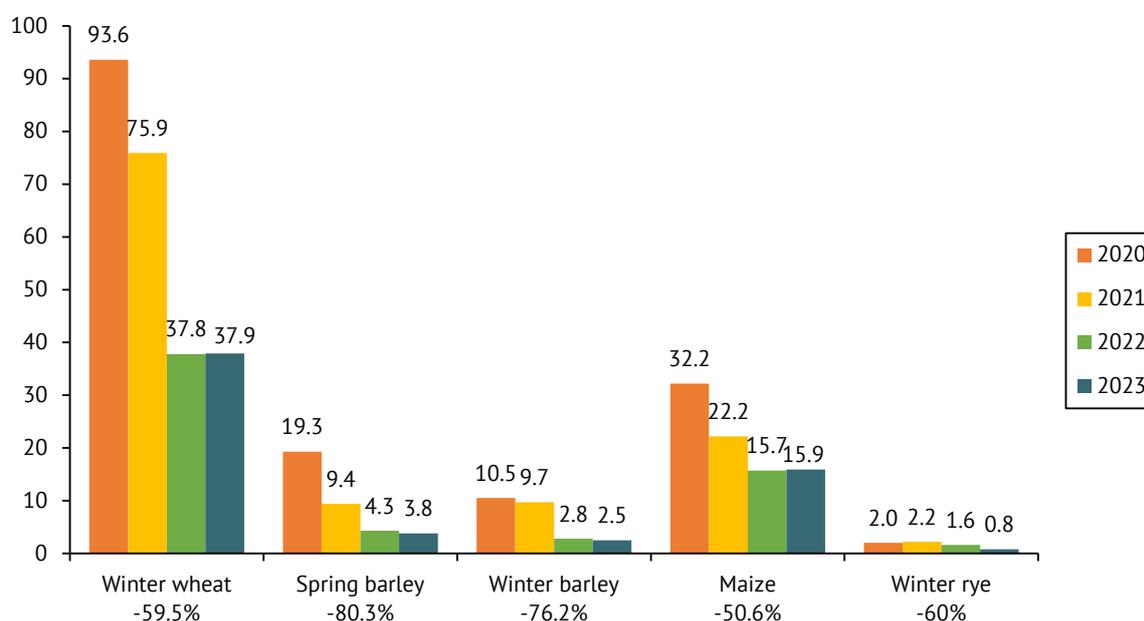


Figure 1. Seed production of Ukrainian grain breeding in 2020-2023, thsd t

Source: developed by the authors of this study based on the Register of certificates for sowing and commodity qualities of seeds (2021-2023)

In 2020-2023, not only did the production of seeds of Ukrainian grain breeding decrease, but so did the share of Ukrainian breeding in the production of conditioned seeds. In 2023, the share of seeds of Ukrainian winter wheat breeding decreased to 48.1%, compared to 66.2% in 2020, or by 18 points. A comparable trend

was also observed for other grain crops. Thus, the share of spring barley seeds of Ukrainian breeding decreased from 57.8% in 2020 to 35.3% in 2023, or by 23 points, winter barley – from 49.3% to 20.2%, or by 29 points, maize – from 29% to 18.3%, or by 11 points, and winter rye – from 15.7% to 13.4%, or by 2 points (Fig. 2).

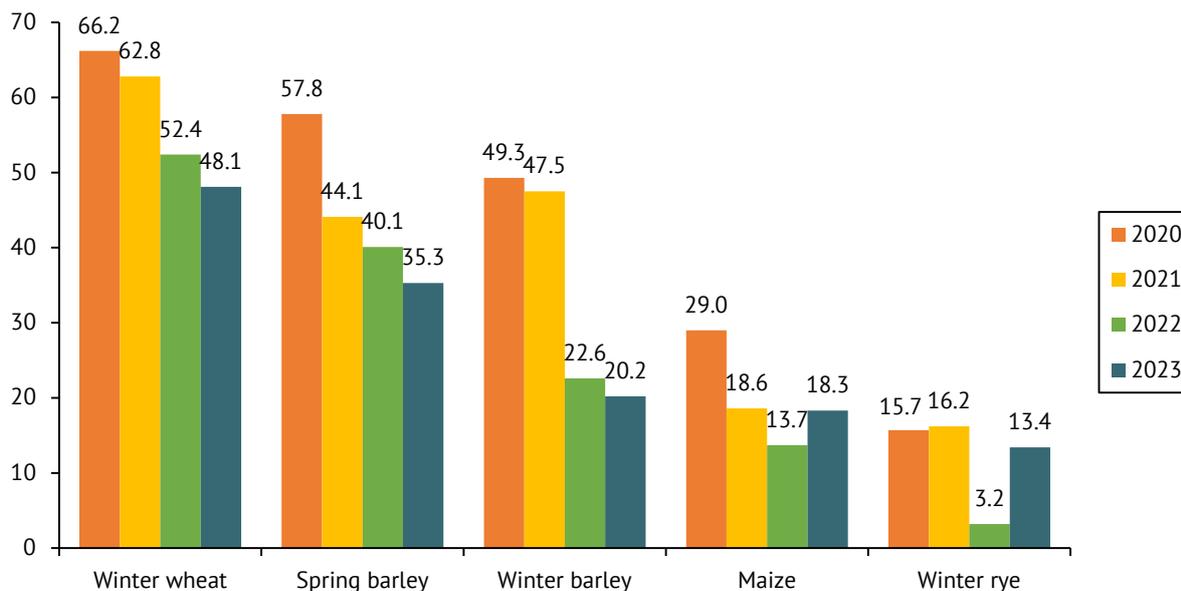


Figure 2. Share of seeds of Ukrainian grain breeding in 2020-2023, %

Source: developed by the authors of this study based on the Register of certificates for sowing and commodity qualities of seeds (2021-2023)

Apart from the steady upward trend in the share of foreign-bred seeds in the Ukrainian market of conditioned seeds, the growing monopoly of powerful multinationals is extremely dangerous for the national seed production system. Specifically, the share of Syngenta maize hybrids in the total production of foreign-bred maize seeds in 2023 was 31.6%, and Monsanto's share was 28.2%. Thus, these two companies together accounted for 59.8% of maize hybrids on the Ukrainian maize seed market. The vast majority of winter rye varieties in Ukraine are also foreign-bred. Moreover, the share of winter rye seeds of KWS Lohov

GmbH in 2023 was 94.7% of foreign-bred winter rye seeds, or 82% of all conditioned seeds of this crop in Ukraine.

A comparable trend is also observed in the market of conditioned oilseeds of Ukrainian breeding. In 2023, 1.4 thsd t of soybean seeds of Ukrainian breeding were produced, compared to 2.3 thsd t in 2020. Accordingly, the decline was 39.1%. The seed production of Ukrainian winter rapeseed also decreased from 1 thsd t in 2020 to 0.5 thsd t in 2023, or 47.4%, and for Ukrainian sunflower seeds – from 3.4 thsd t in 2020 to 2.7 thsd t in 2023, or 20.6% (Fig. 3).

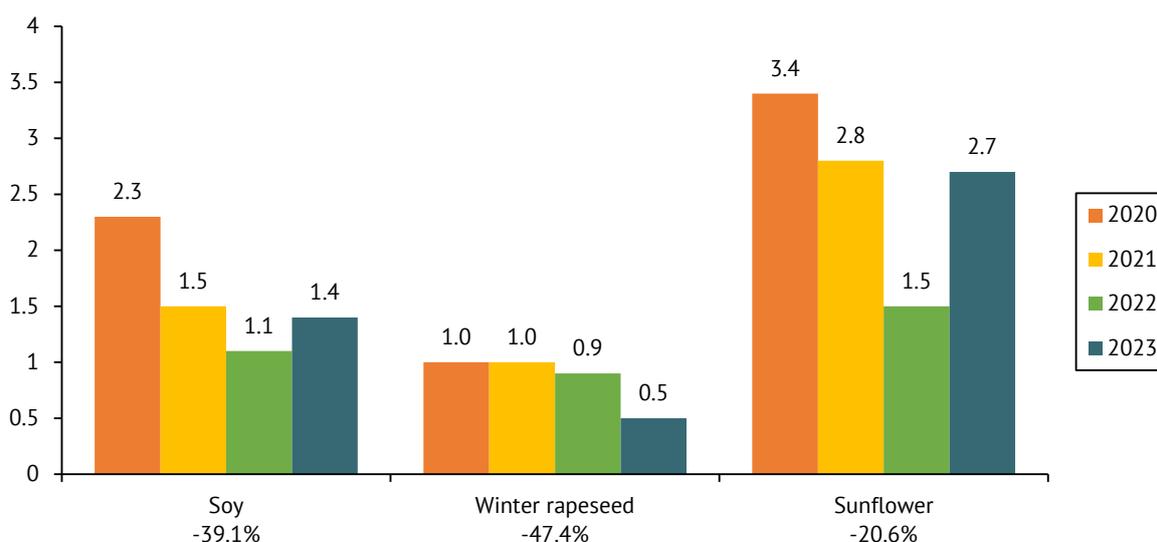


Figure 3: Production of seeds of Ukrainian oilseed breeding in 2020-2023, thsd t

Source: developed by the authors of this study based on the Register of certificates for sowing and commodity qualities of seeds (2021-2023)

In 2023, compared to 2020, the share of Ukrainian-bred seeds of soybean and winter rapeseed also decreased from 10.7% to 6.4% and from 10.2% to 8.9%,

respectively. At the same time, the share of sunflower seeds of Ukrainian breeding slightly increased in 2023 and amounted to 9.1% compared to 7.4% in 2020 (Fig. 4).

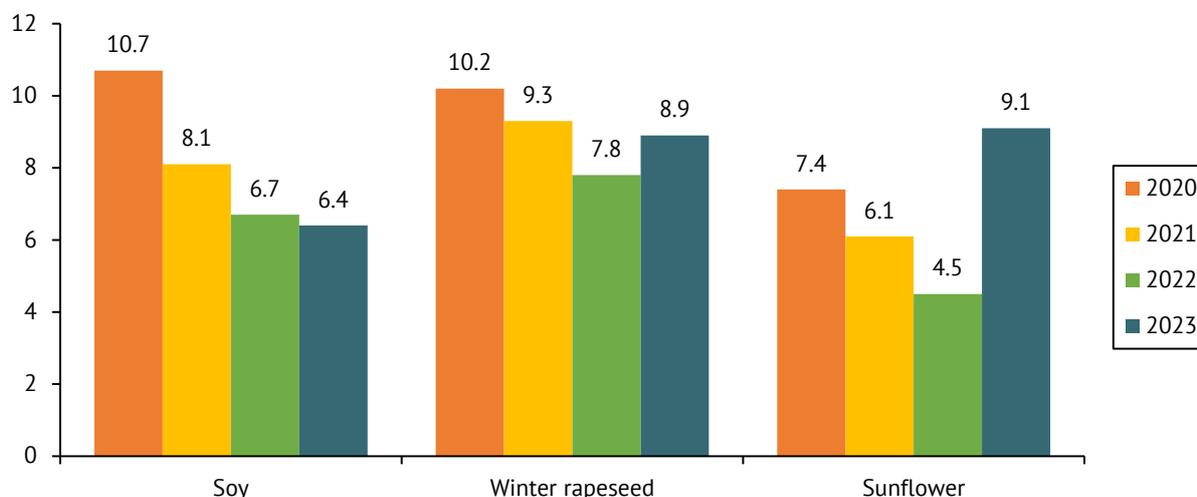


Figure 4. The share of seeds of Ukrainian oilseed breeding in 2020-2023, %

Source: developed by the authors of this study based on the Register of certificates for sowing and commodity qualities of seeds (2021-2023)

According to O.M. Mohylina *et al.* (2022), the main problems that hinder the development of seed production in Ukraine include lack of state control over the implementation and compliance with regulations; high competitive pressure from foreign firms and corporations, seed companies, which leads to further “shadowing” of the seed market; bankruptcy of state research farms subordinated to scientific institutions of the National Academy of Agrarian Sciences and licensing farms of various legal forms, which makes it impossible to produce certified seeds in full volumes of Ukrainian selection; violation of cultivation technologies, variety renewal, and variety replacement, which worsens the condition and sowing quality of seeds.

At the same time, the war with Russia exacerbates the existing problems of seed production in Ukraine. Disruptions in the logistics supply chain of conditioned foreign seeds necessitate fundamental changes in the current system of seed breeding and production in Ukraine. Replacing foreign-bred seeds with Ukrainian-bred seeds, which are more adapted to local growing conditions and meet modern requirements in terms of quality and yield, will help provide agricultural producers with quality seeds in the required quantity and within the required timeframe for sowing. However, such a strategy requires an increase in funding for national breeding centres, relevant research institutions and breeders, which are currently inadequately funded.

A major area for the development of an effective seed production system in Ukraine should be the support and preservation of local zoned crop varieties. L. Batten *et al.* (2021) note that the value of traditional varieties, which have historically evolved through the

influence of the environment, including climatic conditions, pests, and diseases, making them well-adapted to the local environment, is conditioned by their ability to recover from environmental stresses. Furthermore, they are carriers of powerful genetic information that can be used for further seed breeding. To ensure the sustainability of Ukrainian agriculture, it is necessary to develop an effective, dynamic, and resilient national breeding and seed production system based on the preservation of local varieties and their use in breeding activities.

Allowing the cultivation of genetically modified plants could be extremely dangerous for Ukraine, its seed, food, economic, and national security. On 23 August 2023, the Verkhovna Rada of Ukraine adopted the Law of Ukraine “On State Regulation of Genetic Engineering Activities and State Control over Placing Genetically Modified Organisms and Products on the Market” (2023), which will enter into force on 16 September 2026. Considering the prominent level of import dependence of the Ukrainian seed market in Ukraine, the legalisation of genetically modified crop varieties poses a threat to the national system of plant breeding and seed production.

L.H. Biliavska *et al.* (2020) reported that the system of the National Academy of Agrarian Sciences of Ukraine includes 12 scientific institutions, including the Breeding and Genetic Institute – National Centre for Seed Science and Variety Studies, the Institute of Bioenergy Crops and Sugar Beet of NAAS, the V.Ya. Yuriev Institute of Plant Production of NAAS, the National Research Centre “V.E. Tairov Institute of Viticulture and Winemaking”, which have biotechnology laboratories, relevant equipment and specialists, and can organise

and support the creation, evaluation, and use of GMOs. However, following the current legislation and certain financial problems, research on GMOs is not carried out in the scientific institutions of the National Academy of Agrarian Sciences.

If the cultivation of genetically modified plants is legalised in Ukraine, it will open the market for genetically modified seeds to large corporations. The use of GMO plants will have a considerable negative impact on Ukraine's plant breeding and seed production system. B. Balasynovych and Yu. Yaroshevska (2010) warn that the massive use of GMOs reduces the varietal diversity of crops derived from a limited set of parental varieties, resulting in a narrowing of the genetic base of seed production. According to their estimates, the production and market of seeds in Ukraine may be monopolised by several multinational companies, including Monsanto, which owns 94% of the gene pool of all GM plants grown in the world and, together with several other multinational companies, controls 80% of the pesticide market, including 90% of the production and sale of the Roundup herbicide. There is a real threat that the gene pool of crops that determine the country's food potential may be concentrated in the hands of a few companies. R. Reich (2018) points out that Monsanto is using its political power in Washington to fight other countries' efforts to ban genetically modified seeds.

According to S. Grigorenko (2023), the approved circulation of GMOs in Ukraine will suspend investment in the seed business, leading to job losses, and will have an adverse impact on the organic market. Experts believe that the cessation of seed exports to the EU alone will result in an estimated loss of USD 100 million annually. The spread of GMO crop varieties causes genetic modifications in the food chain. Pollen or seeds from genetically modified crops contaminate conventional crops, often causing seed or product recalls and other problems for farmers and consumers. The regulatory mechanisms needed to prevent contamination are either absent or severely inadequate, putting export markets, farmers' livelihoods, and consumer confidence at risk (Center for Food Safety, 2015).

The spread of GMOs poses a threat to agrobiodiversity in Ukraine, including genetic diversity, and may cause genetic erosion. B. Balasynovych and Yu. Yaroshevska (2010) warn of a negative impact on biodiversity caused by the damage of non-target insects and soil microflora by toxic transgenic proteins with increased doses of pesticides and disruption of trophic chains. At the same time, GMO contamination due to cross-pollination of crops will cause problems when exporting products to the EU and China (Seed Association of Ukraine, 2023).

Therewith, Ukraine already has a problem of illegal cultivation of genetically modified plants that needs to be addressed. The All-Ukrainian Agrarian Council notes that the shadow segment of GMOs in the agricultural sector of Ukraine in terms of individual crops

is significant, with the largest cultivation of genetically modified soybeans (UAC, 2023). According to market participants, as of 2021, approximately 50-65% of soybeans grown by Ukrainian producers are genetically modified, rapeseed crops account for up to 12%, and maize – approximately 1% (GMOs – good or harmful, 2021). Breeding activities require a significant amount of long-term investment in research and development by institutions and enterprises, as seed production is a more costly type of economic activity compared to crop production. According to the calculations of N.P. Louwaars and G. Manicad (2022), conditioned seeds should be 1.5-2 times more expensive than food grains of the same crop to break even. Furthermore, significant investments in research and breeding should be considered.

In Ukraine, breeding activities currently require substantial government support, including investment, as the level of use of foreign varieties in certain crops has reached a critically high level. At the same time, the rights and interests of breeders must be protected. Empirical research by C.R. Nhemachena *et al.* (2019) confirms that strengthening intellectual property rights for plant varieties creates incentives for plant breeding companies to invest more resources in plant breeding. M. Campi (2017) believes that strengthening plant intellectual property rights will lead to an increase in the production of improved crop varieties and technologies, which will positively contribute to agricultural productivity and economic growth. Ensuring intellectual property rights and providing fair remuneration to breeders who create new varieties and hybrids of crops will help to increase the productivity of intellectual labour and stimulate the development of breeding activities in Ukraine.

For the seed production system to function effectively, it is also important to ensure that innovative products are introduced into production and distributed. An advisory service could become a kind of chain between breeders/breeding centres and agricultural producers. However, agricultural advisory services in Ukraine have not yet been properly developed. FAO research (Huseynov, 2021) found that in Ukraine, large agricultural holdings and medium-sized agricultural enterprises with an area of more than 500 ha receive consulting services almost entirely from international and foreign companies; 33,164 family farms with an area of 20 ha to 500 ha have average access to advisory services, 90% of which are provided by raw material suppliers whose impartiality is questionable, and only 10% by professional independent advisers. Moreover, 4 million small farmers (2-20 ha) in Ukraine are poorly serviced by advisory services due to the lack of proper incentives from the state and information about the availability of such services.

The breeding and seed production system should be able to change in response to new challenges and threats, and the preservation and maintenance of

Ukrainian zoned varieties adapted to the local environment will contribute to the conservation of agrobiological and genetic diversity and increase the sustainability of agricultural production. Breeders' activities should be aimed at increasing the resilience of the seed production system, i.e., they should consider possible changes in crop growing conditions and consumer preferences in the future.

CONCLUSIONS

In Ukraine, in 2020-2023, there is a steady downward trend in the volume of production of seeds of Ukrainian breeding of major crops and the spread of foreign varieties. Specifically, the production of Ukrainian-bred winter wheat seeds in 2023 decreased by 59.5% compared to 2020, spring and winter barley – by 80.3% and 76.2%, respectively, maize – by 50.6%, and winter rye – by 60%. The production of seeds of Ukrainian oilseeds also declined. In 2023, compared to 2020, the decline in production of Ukrainian-bred winter rapeseed was 47.4%, while soybean and sunflower seeds were 39.1% and 20.6%, respectively. In 2020-2023, the share of seeds of Ukrainian breeding of major grains and oilseeds also declined. In 2023, the share of seeds of Ukrainian breeding of winter wheat was 48.1% compared to 66.2% in 2020, spring barley – 35.3% vs. 57.8%, winter barley – 20.2% vs. 49.3%, maize – 18.3% vs. 29%, winter rye – 13.4% vs. 15.7%, soybeans – 6.4% vs. 10.7%, and winter rapeseed – 8.9% vs. 10.2%.

The legalisation of genetically modified crop varieties is a threat to Ukraine's seed, food, and national security. Access to the Ukrainian seed market by powerful transnational corporations, which are already monopolists in certain segments of GMO crop varieties in other countries, is likely to be disruptive to the national seed breeding system. Furthermore, the spread of GMO crops

threatens the loss of biodiversity and is dangerous for the sustainable development of Ukraine. Supporting Ukrainian zoned varieties adapted to the local environment will help to preserve agrobiological and genetic diversity and increase the sustainability of agricultural production. Global climate change, land degradation, and drought are some of the biggest current challenges and threats that will have a long-term impact on Ukrainian agriculture. At the same time, the war with Russia is exacerbating environmental problems. In this regard, the national breeding and seed production system needs to be fundamentally changed, as it must be able to ensure the development of new crop varieties adapted to new conditions on a continuous basis.

Building an effective, sustainable, and dynamic national seed production system requires long-term investment in breeding activities to ensure a continuous process of innovation and seed quality improvement. The protection of the rights and interests of breeders is a crucial factor in effective breeding activities. Breeding activities should be aimed at ensuring the sustainability of the seed production system. Breeders will consider possible changes in crop growing conditions and consumer preferences in the future to increase agricultural productivity and development. In the future, research on the functioning and development of the national system of breeding and seed production should be systematic. This will allow building an effective model of the national breeding and seed production system with set goals and development parameters.

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CONFLICT OF INTEREST

The authors of this study declare no conflict of interest.

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Анотація. Формування ефективної системи насінництва в Україні зумовлене як її ключовою роллю у забезпеченні насінневої, продовольчої й національної безпеки країни, так і появою нових викликів і загроз, які впливають на функціонування системи та яким необхідно протидіяти, щоб усунути або пом'якшити їхній негативний вплив. Метою статті було дослідження сучасних тенденцій функціонування системи насінництва України та виявлення нових викликів і загроз національним інтересам. Методологічним базисом проведеного дослідження є діалектичний метод наукового пізнання, який було застосовано для встановлення взаємозв'язків між об'єктом дослідження, в якості якого виступає система насінництва України, й подіями та явищами, що відбуваються у природі та суспільстві та які мають істотний вплив на об'єкт дослідження. Також було застосовано методи аналізу й синтезу, системного узагальнення та порівняльного аналізу. У статті було проведено аналіз умов функціонування системи селекції та насінництва в Україні та встановлено сучасні тренди, які характеризують її внутрішній стан. Встановлено виклики та загрози національній системі насінництва, які створюють небезпеку насінневої, продовольчої і національній безпеці України. Проаналізовано деструктивні процеси в системі функціонування національної системи насінництва, які можуть призвести до її деградації та руйнації. Обґрунтовано заходи щодо подолання наслідків дії негативних чинників в системі селекції та насінництва України. В дослідженні були науково обґрунтовані основні критерії формування ефективної національної системи насінництва. Здійснено аргументоване обґрунтування необхідності довгострокових інвестицій у селекційну діяльність та визначено пріоритетні напрями державної підтримки системи насінництва в Україні. Висновки, пропозиції та практичні рекомендації мають прикладне значення і можуть бути використані при розробці відповідних програм та заходів, спрямованих на підтримку розвитку насінництва, зокрема селекційної діяльності в Україні, та забезпечення справедливої винагороди селекціонерам, які є авторами нових продуктивних сортів сільськогосподарських культур

Ключові слова: селекційна діяльність; насіння та садивний матеріал; сорт; насіннева безпека; стійкість; продовольча безпека
