

MANAGEMENT OF COUNTERACTING THE INVASIVE CROPS' SPREAD IN THE UKRAINIAN ECONOMY AGRARIAN SECTOR SECURITY SYSTEM

МЕНЕДЖМЕНТ ПРОТИДІЇ ПОШИРЕННЮ ІНВАЗІЙНИХ КУЛЬТУР В СИСТЕМІ ЗАБЕЗПЕЧЕННЯ БЕЗПЕКИ АГРАРНОГО СЕКТОРА ЕКОНОМІКИ УКРАЇНИ

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The article substantiates the conceptual bases and offers practical recommendations to counteract the spread of invasive crops in Ukraine. The particular danger of the rapid spread of certain species of hogweed in Ukraine is emphasized. The foreign experience of controlling invasive plants spread on the lands of individuals, local communities, and agricultural producers is analysed. The Ukrainian regulatory base on the regulation of agricultural land use has been investigated. Proposals for counteracting the spread of dangerous species of hogweed are substantiated, namely: monitoring of areas planted with hogweed; development of local programs for counteracting the natural self-sowing of hogweed and more. It is recommended to set up specialized local committees to combat the spread of hogweed. The tasks of such committees should be to develop programs that address the specificities of local ecosystems and agro-industrial complexes.

Key words: *invasive crop, hogweed, agricultural land, agrarian sector, threat.*

В статті обґрунтовано концептуальні основи та пропонується практичні рекомендації щодо протидії поширенню інвазійних культур

в Україні. Підкреслюється особа опасность быстрого распространения в Украине некоторых видов борщевика. Проанализирован зарубежный опыт борьбы с распространением инвазивных культур на землях частных лиц, местных общин и сельскохозяйственных производителей. Исследована украинская нормативная база по регулированию использования земель сельскохозяйственного назначения. Обоснованы предложения по противодействию распространению опасных видов борщевика, а именно: мониторинг территорий, засеянных борщевиком; разработка местных программ противодействия естественному самозасеву борщевика и прочие. Рекомендуется создавать специализированные местные комитеты по борьбе с распространением борщевика. Задачи таких комитетов должны включать разработку программ, учитывающих особенности местных экосистем и агропромышленных комплексов.

Ключевые слова: *инвазивная культура, борщевик, земли сельскохозяйственного назначения, аграрный сектор, угроза.*

У статті обґрунтовано концептуальні основи та запропоновано практичні рекомендації щодо протидії поширенню інвазійних культур в Україні. Наголошено на особливій небезпеці швидкого поширення окремих видів борщівника теренами нашої країни. Проаналізовано зарубіжний досвід боротьби з розповсюдженням інвазійних рослин на землях приватних осіб, місцевих громад та виробників сільськогосподарської продукції. Звернено увагу на можливості негативного впливу борщівника на здоров'я людей, які контактують з ним, що спричиняє зниження працездатності та потребує видатків на лікування. Підкреслено руйнівні наслідки стихійного поширення борщівника для якості сільськогосподарських земель та екосистем. Досліджено вітчизняну нормативно-правову базу з питань регулювання використання земель сільськогосподарського призначення. Пріоритетно увагу адміністративній відповідальності за бездіяльність щодо вирішення проблеми неконтрольованого поширення інвазійних культур на території України. Запропоновано посилити відповідальність місцевих органів влади та територіальних громад за нежиття належних заходів по боротьбі з поширенням інвазійних культур. Обґрунтовано пропозиції щодо протидії поширенню небезпечних видів борщівника, а саме: проведення моніторингу площ, засіяних борщівником; розроблення місцевих програм протидії стихійному самозасіву борщівника тощо. Серед локальних заходів запропоновано розробку цільових фінансованих програм із систематичного викошування, викорчування борщівника до визрівання насіння. Досвід випасу тварин для боротьби з борщівником переважно отриманий від використання овець, але ця рослина також може бути їжею для великої рогатої худоби. Вівці та велика рогата худоба надають перевагу молодим та свіжим пагонам, а найефективніший контроль досягається, якщо починати випас на початку сезону, коли рослини невеликі. Як правило, худобі потрібен певний проміжок часу, щоб звикнути до борщівника, перш ніж вона регулярно їстиме ці рослини. У деяких густозасіяних борщівником місцях доцільно сформувати лісові насадження для створення затінку, що несприятливий для росту цієї інвазійної культури. Виявлено взаємозв'язок проблеми поширення борщівника із проблемами вирубування лісу та вирубку бурштину в Україні. Землі, на яких відбуваються вказані види діяльності, передусім, можуть бути колонізовані борщівником, як плодючою, та витривалою рослиною, невибагливою до якості ґрунтів. Відповідна загроза поки що не озвучувалась і, відповідно не обговорювалась науковцями, посадовими особами, громадськістю. А саме в місцях вирубування лісу та вирубку бурштину можуть утворитись потужні джерела розсіювання борщівника вітром на інших землях, передусім, сільськогосподарських полях, оскільки вони не мають затінку, що створюється деревами. Виявлені загрози безпеці аграрного сектору України та, можливо, сусідніх країн спонукають розгляд питань не тільки боротьби з борщівником, але і його аграрного та промислового використання. Рекомендовано організувати на місцях спеціалізовані комітети для боротьби з поширенням борщівника. Серед завдань таких комітетів має бути розроблення програм, що враховують специфіку місцевих екосистем та агропромислових комплексів.

Ключові слова: *інвазійна культура, борщівник, землі сільськогосподарського призначення, аграрний сектор, загроза.*

Problem formulation. The Ukraine economy agrarian sector security depends largely on the nature of the use of its land resources, among which the main role belongs to agricultural lands. Pursuant to Article 22 of the Land Code of Ukraine [1], agricultural-purpose lands are recognized as lands allocated for agricultural production, agricultural research and training activities, placement of relevant production infrastructure, including infrastructure for wholesale markets of agricultural products or intended for

these purposes. Agricultural-purpose lands include: agricultural land (arable land, perennial crops, hayfields, pastures and fallows); non-agricultural lands (economic paths and runs, field forest strips and other protective plantations, except those referred to forest lands, lands under farm buildings and yards, lands under the infrastructure of wholesale agricultural markets, lands of temporary conservation, etc.

Agricultural-purpose lands are a separate category of lands in Ukraine and account for a large share

of the land fund of Ukraine. Increased legal protection of agricultural-purpose lands means prioritizing land use in agriculture. However, in the current context, invasive crops capture an increasing area of Ukrainian land through self-seeding. Among these crops, the greatest threats are some species of hogweed.

Invasive alien plants, such as hogweed, are of increasing concern. Based on the problems caused by such invasive weeds on most other continents, Ukraine and all of Europe are now suffering from alien species that have a serious negative impact on various ecosystems and agricultural potential. Hogweed and other invasive alien plants reduce local plant biodiversity. They can cause significant economic damage, sometimes also posing a risk to human health. There is no universal tool to stop these invasive plants, reduce their impact or prevent future infestations. Hogweed seeds can remain viable in the soil for 15 years. For this reason, long-term monitoring is very important.

Analysis of recent research and publications.

In Ukraine, the study of hogweed problems is carried out mainly from the medical, biological, and environmental point of view [2; 3; 4; 5].

Unfortunately, Ukrainian scientists do not pay enough attention to the problems of hogweed spreading as the agricultural sector detriment, economic factors, and the consequences of the respective processes. In Ukraine, there is no conceptual basis for the development of state and local programs to combat the spread of hogweed. The article attempts to contribute to the solution of this problem, taking into account foreign experience.

Foreign scientists have made a significant contribution to the substantiation of organizational, economic and financial mechanisms to counteract the spread of hogweed. Their contribution is represented by hundreds of works, several of which are presented in the references list to this article [6; 7; 8; 9].

Given the need to develop sustainable solutions to stop the spread of invasive species, such as hogweed, the Giant Alien project in the framework of the 5th Framework Program of the European Union, which uses an integrated approach to develop just such a sustainable strategy to control invasive alien weeds in Europe. The project began in January 2002 and ended in April 2005. 8 partners and 3 subcontractors, as well as more than 40 scientists from 7 countries, attend it.

Setting article objectives. One common goal of the article is to provide Ukrainian authorities (for example, municipalities, districts, road agencies, environmental agencies) and private landowners with scientifically sound but simple and practical management methods to reduce the number and prevent the further spread of invasive hogweed. This article is an attempt to disseminate, in a few words, the latest knowledge about all relevant aspects of the combat against hogweed.

Methodological functions in relation to the development of the concept of combating the spread of hogweed are performed by: general systems theory since this theory solves the problems of stability, safety, security of various systems under the influence of destructive factors on them; general management theory since the prevention of dangers and threats to the security of the agricultural sector is impossible without certain information and control actions.

Research main material presentation. Hogweed is the common name for a group of closely related high species of the hogweed genus, which were introduced to Europe. They are one of the largest herbs in Europe, and with their impressive appearance and dominant colonies, the plants are familiar to river authorities and land surveyors in most European countries. The average hogweed produces a whopping 20,000 seeds that can fall very far from the plant.

In Ukraine and parts of Europe, hogweed is grown as a culture for silage production. After this practice was stopped, the crop established itself in very extensive and dense plantations, taking advantage of the widespread abandoned arable land and a significant reduction in the number of grazing animals. The experiments in these former fields, in which the hogweed now lives, led to some recommendations for the restoration of pasture after fighting with the hogweed.

In Ukraine, the combat against hogweed has been declared at the state level but is rarely appeared in specific practical measures. According to Article 15-2 of the Land Code of Ukraine [1], the powers of the central executive body implementing state policy in the field of state supervision in the agro-industrial complex, in the field of land relations, include the implementation of measures to prevent the owners and users of land from spoiling the land by overgrown with bushes and weeds. Landowners and land users who do not take weed control measures, including hogweed, bear administrative responsibility under Article 52 of the Code of Administrative Offenses [10].

Attitudes to hogweed (except for the species included in the Red Book) should be as a quarantine plant. Quarantine measures aimed at reducing the population of the plant have started to be regional and international. Local activities include the development of targeted funded programs for the systematic mowing, uprooting of hogweed before the seeds ripen.

Hogweed has spread in the north-eastern and north-western United States, and southern Canada and is an invasive species across Western Europe. USA researchers have confirmed the presence of this federally listed "noxious weed" in such states as Virginia, Maine, Massachusetts, Vermont, Connecticut, New York, Pennsylvania, North Carolina, Michigan, Illinois, Washington, and Oregon. It is even created the New York Department of Environmental Conservation's Hogweed Program Coordinator. The spread of hogweed throughout Europe continued

until the mid-20th century when the danger of hogweed became more widely known. However, despite warnings, the plant continued to be used by gardeners, beekeepers, and farmers (for feeding livestock) for another 50 years. The European Union funded the Giant Alien project to combat hogweed. On August 2, 2017, it has been added to the List of Invasive Alien Species of Union concern. In the United Kingdom, the Wildlife and Countryside Act 1981 makes it an offence to plant or cause hogweed to grow in the wild.

In addition to environmental problems, high invasive species of hogweed also pose a serious danger to human health. The main risk groups are people who come into contact with the plant during their work, such as gardeners or landscape workers.

The experience of grazing was mainly derived from the use of sheep but the plant is also very tasty for livestock. There are facts of grazing goats and horses in connection with the control of hogweed. Sheep and cattle prefer young and fresh crops, and the most effective control is achieved by starting grazing at the beginning of the season when the plants are small. As a rule, livestock needs a period of time to get used to hogweed before they regularly eat plants. But soon, animals have a preference for hogweed, and large areas of the plant can be removed.

In some fields which are densely planted by hogweed, it is advisable to form forest plantations to create a shade that is unfavourable to the growth of this invasive crop. We claim that there is a relationship between the problem of hogweed spreading with the problems of deforestation and amber mining in Ukraine. The lands on which these activities take place can, first of all, be colonized by hogweed as a fertile and hardy plant, unpretentious to the quality of the soil. The corresponding threat has not yet been announced and, accordingly, has not been discussed by scientists, officials, the public. Namely, in the areas of deforestation and amber mining, powerful sources of hogweed scattering by the wind in other lands, especially agricultural fields, can be formed since they do not have shade created by trees. Identified threats to the security of the agricultural sector of Ukraine and possibly neighbouring countries prompt consideration not only of the combat against hogweed but also of its agrarian and industrial use.

Numerous tests have demonstrated the vulnerability of hogweed to systemic herbicides. In order to effectively prevent the spread of tall species of hogweed and optimize the use of financial resources, preventive measures should be aimed at those areas that are most likely to be reached by the seeds of hogweed, which also represent suitable habitats. There are several components of this approach to prevention, early detection, and rapid response: developing policies and guidelines for best practices; identification of the penetration paths of seeds and areas that can be reached by seeds; identification of habitats most vulnerable to

intrusion; awareness-raising program; surveys and other mechanisms to monitor the distribution of hogweed, and especially to identify new populations; eradication campaign in which preventive measures are not implemented, and subsequent monitoring.

Therefore, at the first stage, it is necessary to draw up a map of the distribution of all existing populations, especially in neighbouring occupied regions. It is very important to involve the public in the dissemination of information materials as a part of an awareness-raising campaign. The public can be informed about the problems caused by hogweed. This can be done using websites for a specific area, local newspapers, radio and television programs and posters, brochures, and leaflets. A targeted public awareness program needs to be developed. Awareness-raising should be targeted at key groups, such as road and river managers, and companies intentionally or unintentionally transporting soil. Another useful method that can be used to determine the distribution of these visible aliens is aerial photographs during flowering and early fruiting (from the second half of June to July).

The relevant authority, after receiving information on a possible new infection, should have the resources to visit immediately the facility in order to confirm identification, assess the situation, including land ownership and access, degree of intrusion and control options.

The details of the information recorded will depend on the storage system and the intended analysis of the data. The storage system can range from a simple system based on registration sheets or cards and a map made manually for displaying sites to the use of computer databases.

Using the information collected during the investigation of the distribution of hogweed, and understanding the mechanisms by which seeds penetrate, it is possible to determine the areas in which seeds can spread. This should be combined with information on the places where hogweed is grown in these areas in order to identify the areas most vulnerable to invasion. There can be compared the distribution of sites with a high content of hogweed with other data, such as land use, habitat quality, proposed development and planning policies. Because data is collected and stored, maps can be used to study the effects of distribution channels, identify habitats that are often associated with crops, and areas of infection risk. Resources for controlling the distribution of hogweed by wind may be limited but plant mapping will allow local authorities to focus on monitoring key locations and prevent further spread of plants. Based on field observations and the integration of survey data with other cartographic information, it is possible to determine the management of hogweed in the region and agree on an implementation plan with stakeholders.

If prevention methods fail and hogweed spreads to new areas, early detection of new populations is

critical for quick response and elimination. If the new population is still small, its elimination is cheaper and more likely to be successful. Therefore, national or local strategies to control or contain hogweed should include early detection programs. However, early detection is only useful if it is supported by an emergency plan for which a strategy needs to be adapted. The plan should indicate the responsible organizations or groups that are ready to act quickly. It is necessary to ensure that they have adequate financial, human, and material resources. Actions will be successful only if they are included in management plans that are integrated into regional and local government policies.

Conclusions from the conducted research.

Special management is essential for former agricultural land that has not been cultivated for several years, as well as for other areas designated for agriculture with severe infection by invasive hogweed. Integrated methods used include mowing/shearing, chemical control, tillage and sowing of grass mixtures.

Hogweed can be controlled manually, mechanically and with the help of herbicides. In some cases, infection with hogweed is best controlled using several different methods in combination or sequentially applying an attack plan in two, three or even four directions. The last part of any control method is the planting of grasses or other vegetation to ensure competition against hogweed and reduce soil erosion. Timely application of herbicides may be effective but numerous applications are usually required. Grazing cows and pigs that are fairly resistant to hogweed sap can help in managing but not in destroying plants. Only without the influx of seeds and several years of constant control efforts hogweed can be destroyed.

We recommend setting up specialized committees to deal with the hogweed. The tasks of such committees should be to develop hogweed combating programs that address the specificities of local ecosystems and agro-industrial complexes.

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