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# ECOLOGICAL AND ECONOMIC PROCESS OF ADAPTATION OF BERRY CULTIVATION IN UKRAINE

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## ABSTRACT

The article analyzes, identifies, and formulates measures for the ecological and economic process of adaptation of berry cultivation in Ukraine. It is substantiated that compliance with environmental standards of berry cultivation in Ukraine can be ensured through various measures. One of the most important measures is the establishment of norms and requirements for the use of fertilizers, pesticides, and other chemical plant protection products. For this purpose, certain limits and norms can be set for the maximum permissible residues of chemicals on grown berries and other products. It is important to conduct regular monitoring of soil and water quality in the areas where berry crops are grown to identify any environmental problems in time and take the necessary measures to address them.

It has been determined that support for the development of small and medium-sized enterprises engaged in the cultivation of berry crops and providing them with financial assistance for the implementation of environmentally friendly growing technologies is necessary.

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## The problem statement.

Ukraine has significant natural, climatic, logistical, and human potential for berry production. However, the structure of the horticulture industry, its nature, underdevelopment or lack of appropriate infrastructure, privatization processes in Ukrainian agriculture, and the need for significant investments to modernize the sector have significantly slowed down its development compared to the current innovative renewal of the horticulture and berry production in leading countries [1]. Today, agriculture is one of the priority sectors of Ukraine's economy. Its development contributes to

improving the material well-being of the population, strengthening the country's economic and food security, and increasing exports of goods [2].

One of the key objectives of modern crop production is to grow high-quality and environmentally friendly products. Various methods and technologies are used in agriculture to achieve these goals.

One of the main methods of growing crops is intensive farming, which involves using highly productive hybrids and plant varieties and applying various mineral fertilizers and chemicals to protect against pests and diseases. However, this method is not always environmentally friendly and may adversely affect the environment.

In addition, an essential component of successful crop production is the use of modern technologies and innovations. For example, irrigation systems that allow efficient use of water resources, protect plants from drought, and provide the necessary moisture can help increase yields and reduce watering costs. Also, using organic methods of protecting plants from pests and diseases can reduce the use of chemicals and minimize the negative impact on the environment.

After all, the introduction of ecological intensification of berry cultivation. That means using environmentally friendly methods and technologies that increase the yield and quality of products without harming the environment. For example, microbial fertilization, biological protection against pests and diseases, organic fertilizers, etc can be used.

In this context, ecological and economic adaptation of berry growing in Ukraine is an important task that will ensure sustainable agricultural development and preserve natural resources.

#### **Previous research and publications analysis.**

Recently, domestic scientists have paid attention to the research on the development of the berry industry and the berry market: Similenko L.P., Shitt P.G., Yurchyshyn V.V., Chukhno D.F., Shestopal O.M., Shumeiko A.I., Elmakovru O.Y., Liev Virginia, I.A. Salo, G.M. Satina. For example, Kernasiuk Y.V. considers the development of berry growth, reveals current trends in the market of products of this industry, and assesses the level of consumption of fruits and berries by the population of Ukraine, trends, and problems of production. To date, the issue of aspects of the ecological and economic processes for the adaptation of berry cultivation in Ukraine remains insufficiently covered.

#### **The aim of the article.**

The paper aims to identify and formulate measures for the ecological and economic adaptation process for growing berry crops in Ukraine.

#### **The main material.**

The development of the fruit and berry business and the market for its products largely depends on the availability of conditions for organizing the storage and transportation of products of this industry and preparing them for sale and delivery to points of sale. Therefore, the prospects for further development of this industry in the economic context are significantly related to the possibilities of improving the state of logistics in it [3].

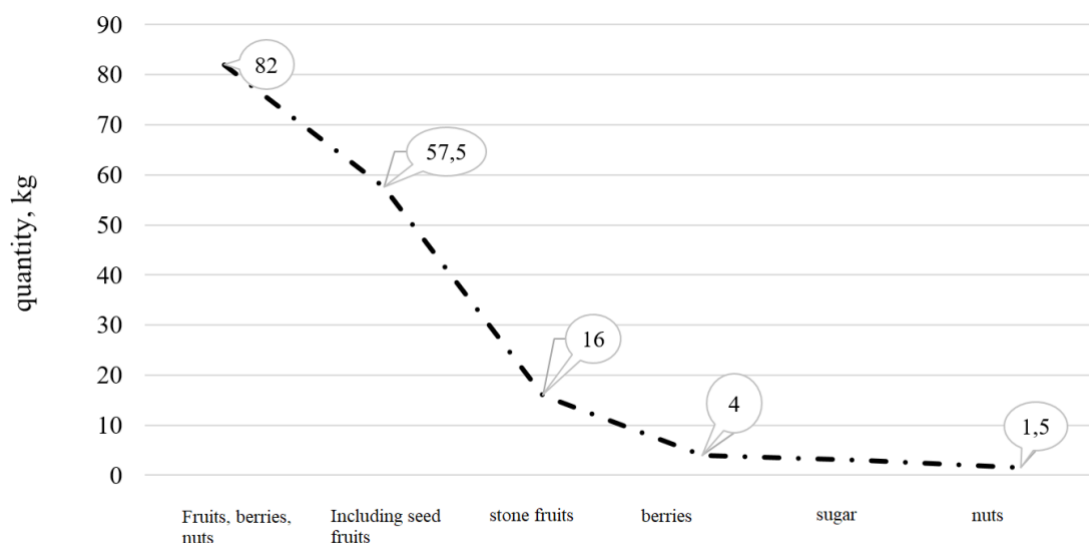
The rise of global perceptions affects the ecological and economic relations that are also being formed in the agricultural sector of Ukraine, which leads to improved planning of all indicators of the adaptation mechanism in berry cultivation [4; 5].

In Ukraine, niche berries such as strawberries, currants, raspberries, sea buckthorn, and honeysuckle are popular, and there is a growing demand for elderberry imports, among others. Growing these crops requires a lot of risks, requiring labor, energy, financial investments, and many other external factors.

At the same time, the cultivation of berry crops is actively developing and gaining momentum [6].

In this aspect, projects for growing niche berry crops are considered investment-intensive. Each farmer must provide for the costs of preparing the field, installing an irrigation system, purchasing planting material, and establishing and maintaining young plantations [7; 8].

When applying the technologies generally accepted in Ukraine, farmers expect to harvest strawberries for 2-4 fruiting seasons, raspberries, currants, gooseberries, or red currants for at least 8-12 years, and garden blueberries for 20 years or more. However, in reality, everything depends on many aspects. It may happen that in the second or third year of the project, the question of the feasibility of further maintenance of the plantation arises. The reasons may be various: low productivity, unsatisfactory quality of the products obtained, or the need to use expensive technological methods; as a result, the project will become unprofitable. According to the National Statistics Service, in 2021, the total area of berry gardens in Ukraine amounted to 217 thousand hectares, yielding 117 tons per ha and 2.2 million tons of fruits, berries, and nuts. The population of 41.130 million people consumed 54.3 kg/year, which means that the scientifically based consumption rate of fruits and berries is 82 kg/year (Fig. 1).



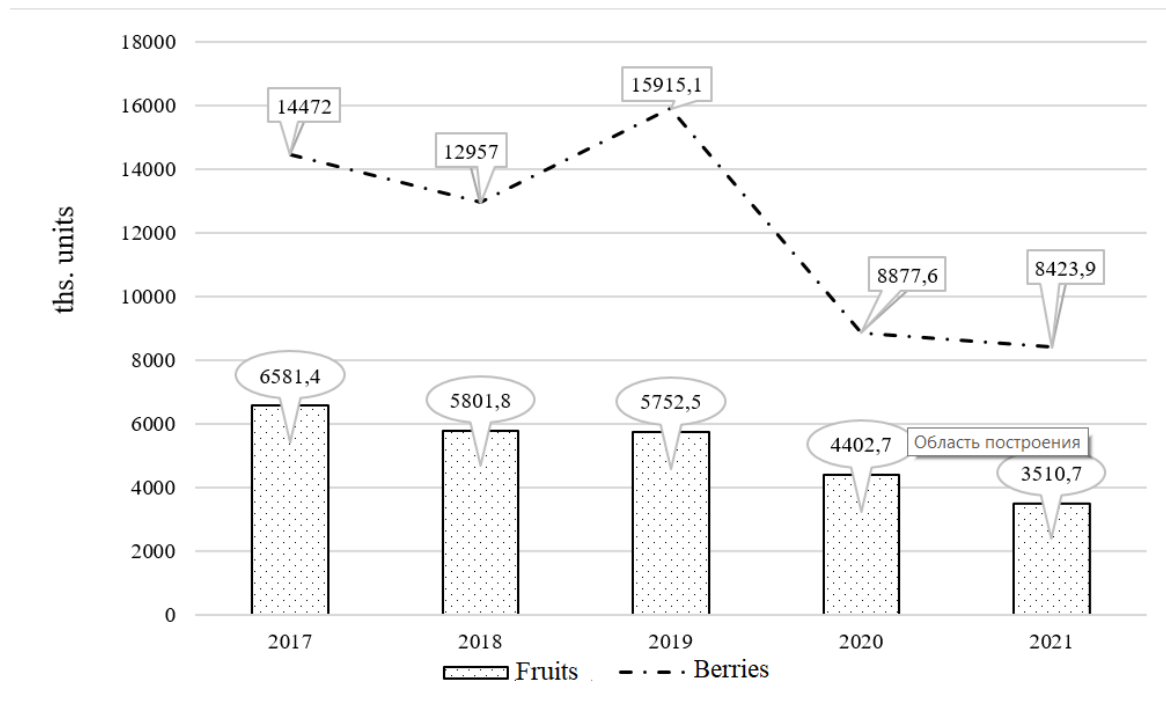
*Fig. 1. Scientifically based norms of fruit and berry consumption.  
Source: based on statistical data of the State Statistics Service of Ukraine.*

This level is 1.6 times lower than the consumption rate (66.2%). The population's needs in Ukraine are met by domestic production of fruits and berries by only 66.2%, including pome fruits by 55%, stone fruits by 81%, and berries by 83% [9].

According to calculations for ensuring a justified offer to the population, the need for domestic fruits and berries should be at least 3.4 million tons. That means an additional general domestic supply of fruits and berries of up to 1.2 million tons is needed.

Traditionally, Vinnytsia, Khmelnytsky, Chernivtsi (over 200 thousand tons), Dnipro (over 200 thousand tons), and Zakarpattia regions are the leaders in fruit and berry production. Their total income in 2021 is almost 50% of the total production and supply of food crop fruits in the country [9].

The production of planting material also almost halved between 2017 and 2021. Seedlings are mainly planted in agricultural enterprises, with self-grown seedlings accounting for a fifth of all planted seedlings. In 2021, there were 3.5107 million seedlings of fruit trees, which is only 53.7% compared to 2017 (Fig. 2). The production of berry seedlings decreased by 41.8% compared to the same period last year.



*Fig. 2. Dynamics of growing seedlings for the period 2017-2021, thousand units.*  
 Source: based on statistical data from the National Statistics Service of Ukraine.

The level of production of fruit and berry products by private households and their productivity is significantly higher than those of industrial enterprises, which indicates a high potential for this category of farms in the future. According to the Law of Ukraine "On Private Peasant Farms" state support for private peasant farms should be provided by the state and regional programs for their development at the expense of the state and local budgets. Such programs are currently absent in Ukraine and therefore, financial support from the state is practically not provided and there is no attraction of additional labor resources or special incentives [10].

Proper planning of fruit and berry plantations allows for full production of high-quality fruit at the lowest cost and to meet public demand, and it is also necessary to take into account the supply and demand of berries from individual regions on the fruit market. It is important to maximize natural opportunities, including geographical and economic factors. That will help to increase productivity, reduce costs and improve product quality. The most rational is to locate orchards near well-equipped transport interchanges to minimize losses during transportation and storage and near the nearest market, i.e. agribusiness, households, canneries, baby food companies, etc.

Planning and implementation of berry cultivation projects have several crucial aspects that must be taken into account to achieve a successful outcome. The main points of such a project include the following stages (Fig. 3):

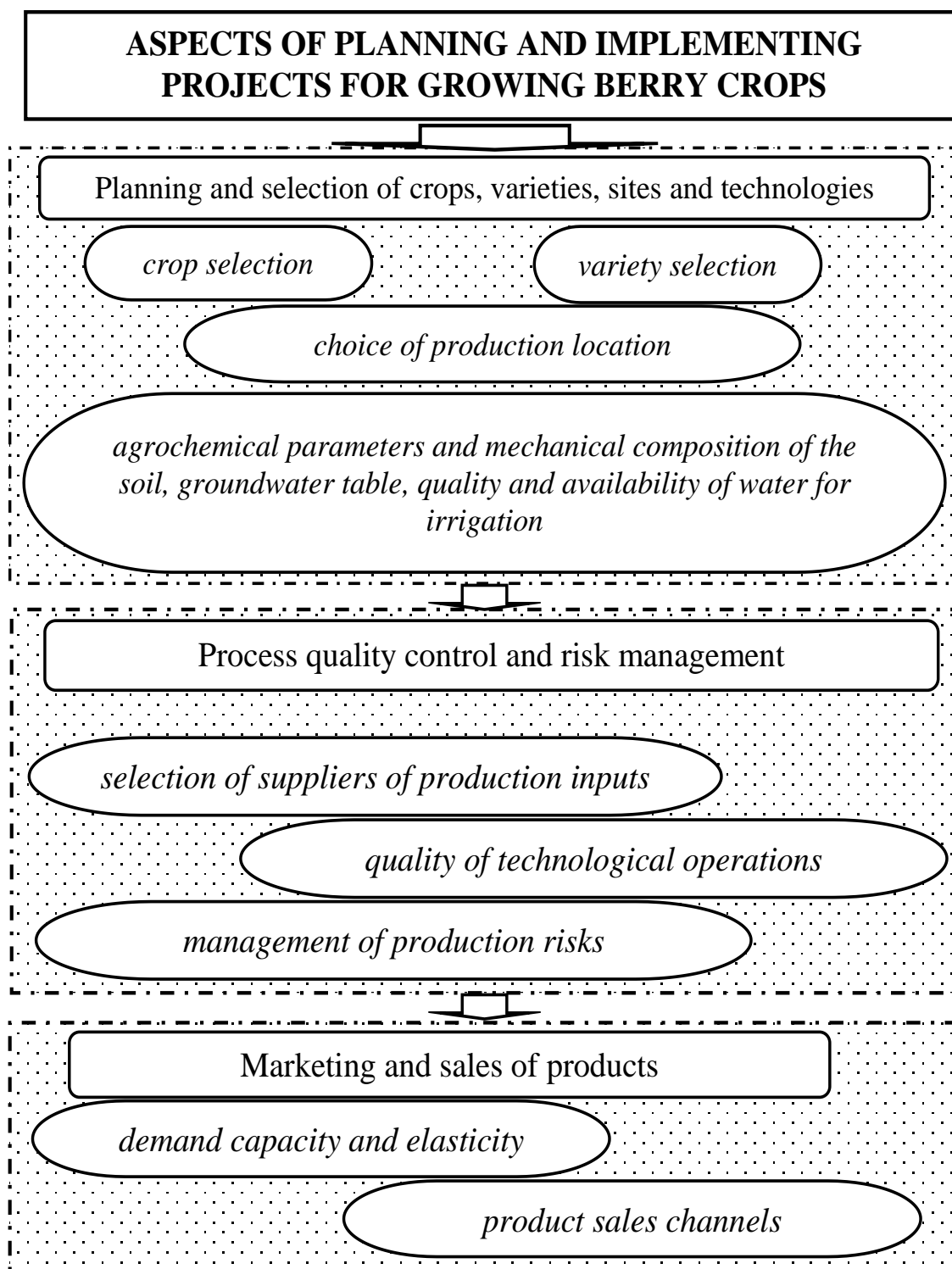


Fig. 3. Aspects of planning and implementing projects for growing of berry crops.  
Source: compiled by the authors.

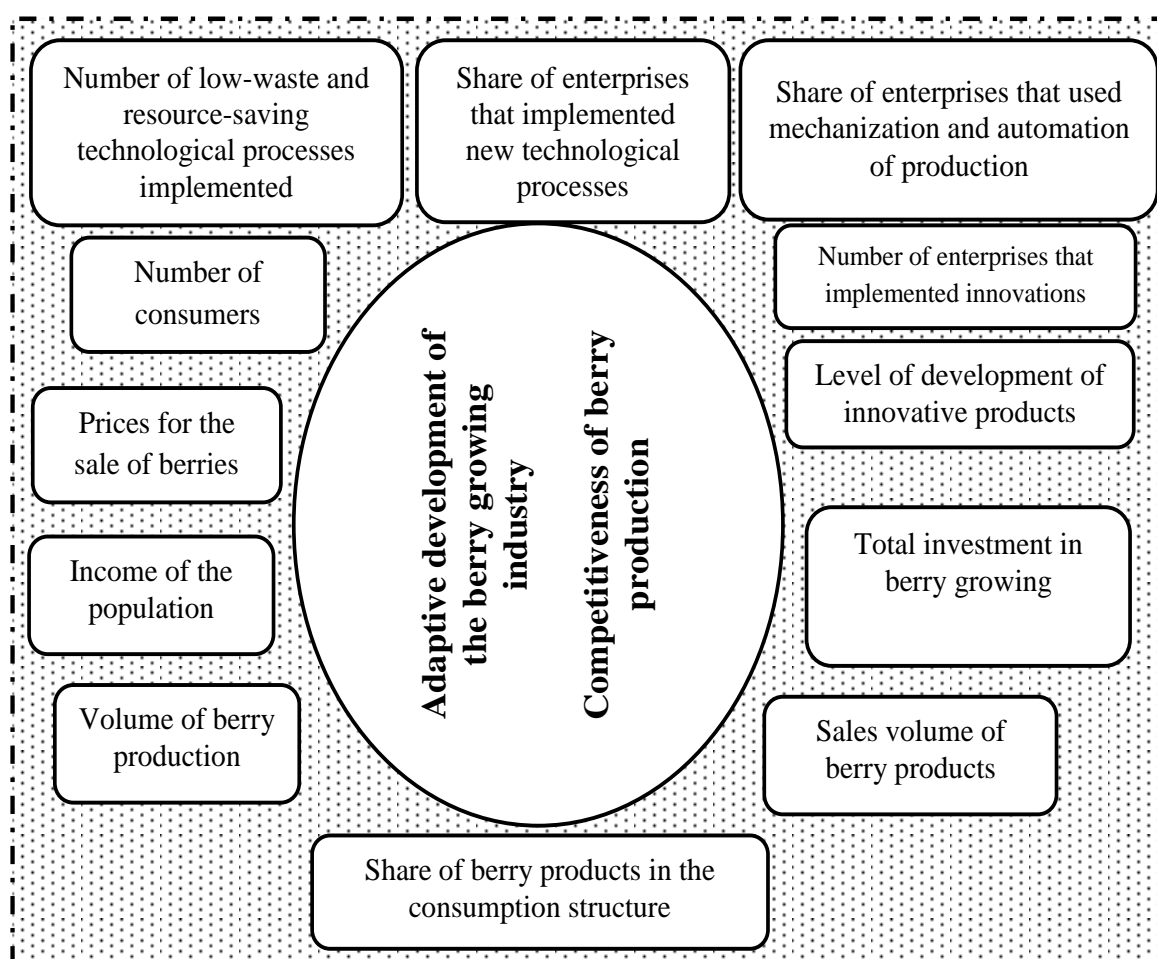
- *determining the place and time of cultivation:* choosing a location for growing berry crops depends on a number of factors, such as soil cover, climatic conditions, availability of water sources, access to markets, and other factors. It is also essential to determine the optimal time of cultivation to ensure maximum yield;
- *selection of berry varieties:* the selection of berry varieties should take into account the needs of consumers, market requirements, as well as the possibilities of growing and caring for crops;

➤ *cultivation planning*: planning the cultivation of berry crops involves calculating the costs of purchasing seeds, disease and pest control agents, fertilizers, and other resources. It is also necessary to develop an irrigation plan and an irrigation system, if necessary;

➤ *preparation of the soil*: before planting berry crops, it is necessary to prepare the soil cover. It may include leveling the surface, irrigation, and littering to increase soil fertility, etc.

Any agricultural market is shaped by economic factors of supply and demand. The effect of these factors is generally that the volume of effective demand increases when the price decreases, and, accordingly, decreases when the price increases. In other words, the volume of demand is inversely related to the price, and the amount of supply increases with the price.

Changes in demand volumes depend on the interrelationships of both external and internal non-price factors, namely internal factors affect changes in the structure of demand, and external factors additionally affect its volumes (Figure 4).



*Fig. 4. Factors of influence on the ecological and economic process of adaptation of the competitiveness of berry production in Ukraine.*

*Source: compiled by the authors.*

Negative situations can be prevented only if the project planning procedure includes reliable information and balanced management decisions are made regarding the location of production, choice of crops, varieties, technologies, and production resources.

The berry business will be profitable only if the project has been developed with a professional analysis of production risks, qualified independent specialists involved in the development, and the experience and mistakes of colleagues and competitors have taken into account.

Thus, the article presents a model of the ecological and economic process of adaptation of berry growing in Ukraine: the main factors that characterize the object of study as a system; processes of interrelationships between its elements; identification and evaluation of influence



factors, etc. It made it possible to understand the impact of individual factors on the competitiveness of berry products.

In this context, support for ecological berry cultivation is essential. These programs may include training producers in environmental methods and technologies, providing them an access to the necessary plant protection products, etc.

Ensuring compliance with environmental standards for berry cultivation in Ukraine can be achieved through various measures. One of the most important measures is the establishment of standards and requirements regarding the use of fertilizers, pesticides and other chemical plant protection products. For this purpose, certain limits and norms can be set for the maximum permissible residues of chemicals on grown berries and other products.

It is also essential to conduct regular monitoring of soil and water quality in the areas where berry crops are grown to identify any environmental problems in time and take the necessary measures to address them.

Other measures include the introduction of berry cultivation technologies that are not only efficient from an economic point of view, but also contribute to the preservation of the environment and human health. For example, organic berry cultivation technologies can be used, which involve the use of natural fertilizers and biological plant protection products against pests and diseases.

It is also essential to support the development of small and medium-sized enterprises engaged in berry cultivation and provide them with financial support for implementing environmentally friendly cultivation technologies.

To summarize, ensuring compliance with environmental standards for berry cultivation in Ukraine is possible through a set of measures that include establishing standards and requirements for compliance, supporting farmers in the transition to environmentally friendly cultivation technologies, implementing a system of certification and labeling of products, ensuring access to effective plant protection products, and improving the control and monitoring system for berry cultivation. Implementation of these measures will ensure the sustainability of berry cultivation in Ukraine, improve the quality and competitiveness of products, and preserve the environment for future generations.

### **Conclusions.**

Thus, standards of berry cultivation in Ukraine can be achieved through a set of measures, including the establishment of norms and requirements for the environmental safety of berry cultivation, the use of modern technologies and innovative solutions, support for farmers in implementing ecological practices, control and monitoring of the use of pesticides and other chemicals in berry cultivation, increasing the volume of organic berry cultivation, and the creation of an effective system of certification and labeling of products. This comprehensive approach will help ensure the sustainability of agricultural development in Ukraine, preserve biodiversity and natural resources, and provide the population with high-quality and safe products.

After all, ensuring and complying with environmental standards for berry cultivation can be achieved through the introduction of environmental certification and cultivation standards. This can be achieved through several measures, such as:

- ✓ the development and implementation of environmental standards for berry cultivation. This may include requirements for the use of fertilizers, pesticides, and other plant protection products, as well as for waste management and pollution control;
- ✓ ensuring the collection and processing of berry crop waste to reduce environmental impact and increase the efficiency of cultivation;
- ✓ introduction of ecological certification of berry crops and their processed products. This will allow consumers to receive high-quality and environmentally friendly products, and encourage farmers to comply with environmental standards. Using alternative methods of growing berry crops, such as organic cultivation, which reduces the use of artificial fertilizers and pesticides and increases yields. Develop and implement a system for monitoring and controlling compliance with environmental standards for berry cultivation. This will allow us to track and identify standards violations and negative ecological impacts



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