

CREATION OF AN ORGANIZATIONAL AND ECONOMIC PLAN FOR A PERMANENT DECORATIVE NURSERY OF LEBEDYN FORESTRY

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Introduction. The Ukrainian ornamental nursery industry has significant potential, which is highlighted by current trends in the development of the private sector. For private producers, the priority tasks are to expand the area and increase production capacity [1]. To meet the growing demand, it is necessary to implement modern technologies and modernize production to improve its efficiency and competitiveness [2]. Expanding the assortment of cultivated ornamental plants to include new, popular, and exclusive varieties. Production of high-quality planting material with a focus on healthy, resistant, and Ukrainian-climate-adapted plants [3, 4]. Scientific and methodological support for improving knowledge and skills, implementation of innovations and best practices. The implementation of these tasks will contribute to the sustainable development of Ukrainian ornamental plant nurseries, making them competitive on the global market [5].

Despite its significant potential, the ornamental plant nursery industry in Ukraine faces a number of challenges. The government does not provide enough financial support to the ornamental plant nursery industry. An underdeveloped market, a lack of transparency, unregulated pricing, and barriers to export [6, 7].

An analysis of the domestic market for ornamental plants shows that most Ukrainian nurseries lack a clear specialization. They offer a wide range (100-200 items) of varieties and forms, without focusing on specific species or groups [8].

There is a multi-channel system for selling ornamental plants in Ukraine, which gives buyers a wide range of choices [9]. These centers offer a wide range of ornamental plants, as well as related products (fertilizers, soil, tools); Supermarkets are often located in convenient locations, such as near shopping malls or highways. Branded stores are typically represented by major ornamental plant growers. This means that they have a wide selection of high-quality plants to choose from. Specialized small shops have a narrow specialization. This means that they focus on a

particular type of ornamental plant, such as indoor plants or fruit tree seedlings. Street trading offers seasonal flowers and seedlings at affordable prices. This is because street vendors do not have the same overhead costs as other sales channels, such as rent and utilities.

Having reviewed the literature, it is clear that the establishment of nurseries in Ukraine has significant potential for development. Thanks to favorable conditions, government support, and the introduction of new technologies, it can become an important sector of the Ukrainian economy.

The purpose of this work is to select information about ornamental nurseries, select a location with a good geographical location and favorable climatic conditions, and develop an organizational and economic plan for a sustainable ornamental nursery.

The climate, terrain, soil, and other natural factors that could affect the growth and development of ornamental plants were studied.

Soil composition: The soil composition on the site where the nursery is planned to be located was determined in order to select the appropriate fertilizers and other agrotechnical measures.

The areas of the sowing, decorative, and mother departments were calculated according to the методичних вказівок [12]. The areas of the production and auxiliary parts of the nursery were calculated (areas of roads, forest belts, economic area, field area, fence, reservoir).

Results. Our work involved the theoretical creation of a nursery based on the State Enterprise "Lebedyn Forestry" and named it "Sakura". It will be located in the Sumy region, Lebedyn district, on the territory of the city of Lebedyn.

The distance to the railway station is 4,2 kilometers, and to the regional center of Sumy city is 42,5 kilometers. This area has a homogeneous relief, which is represented in the form of a wavy plain.

The territory of the Lebedyn district covers an area where two different landscapes meet: the hills of the Central Russian Upland and the flat expanses of the Dnieper Lowland. The Psel River is the main water artery of the Lebedyn district, and its tributaries - Vilshanka and Grun - complement the hydrographic network of the district.

The river system of the Lebedyn district is supplemented by small rivers Budyłka, Tashan, Revky, Lozova and Legan, as well as a cascade of ponds, which make the landscape of the district even more picturesque. The Lebedyn district has favorable soil conditions, since fertile chernozems prevail here, as well as soddy-podzolic and gray forest soils.

The nursery will be located in an area with a temperate continental climate. This means that the winters here are cold and the summers are warm. The average annual temperature is 6.5°C, the coldest month is January, the hottest month is July, precipitation: 500-600 mm per year, the maximum amount of precipitation falls in summer, the minimum in winter.

The snow cover lasts from December to February. The wind is mainly from the west. Spring frosts in Lebedyn usually end on April 7, and autumn frosts begin on October 10. The frost-free period is 186 days.

The characteristics of the hydrothermal indicators of the climate of the region where the nursery will be located are shown in Figures 1, 2, and 3.

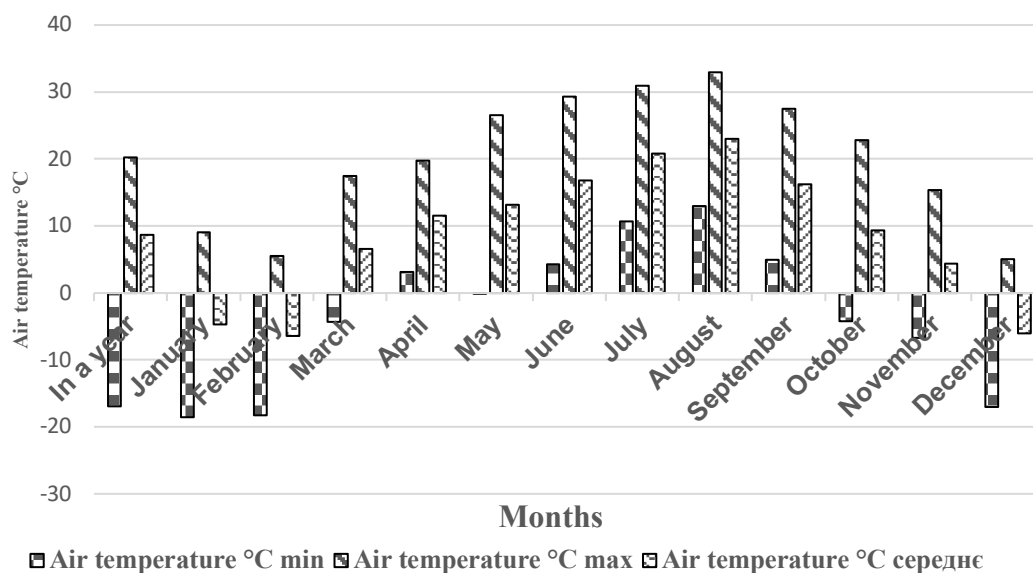


Figure 1. Temperature Indicators, °C.

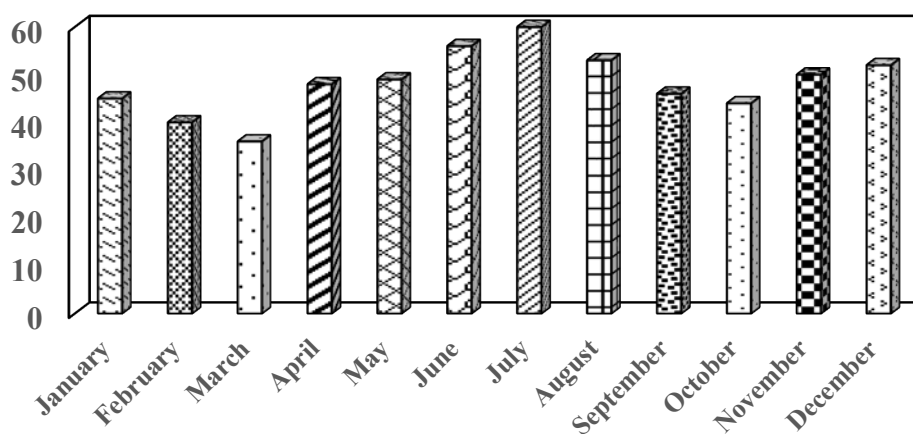


Figure 2. Precipitation Indicators, mm.

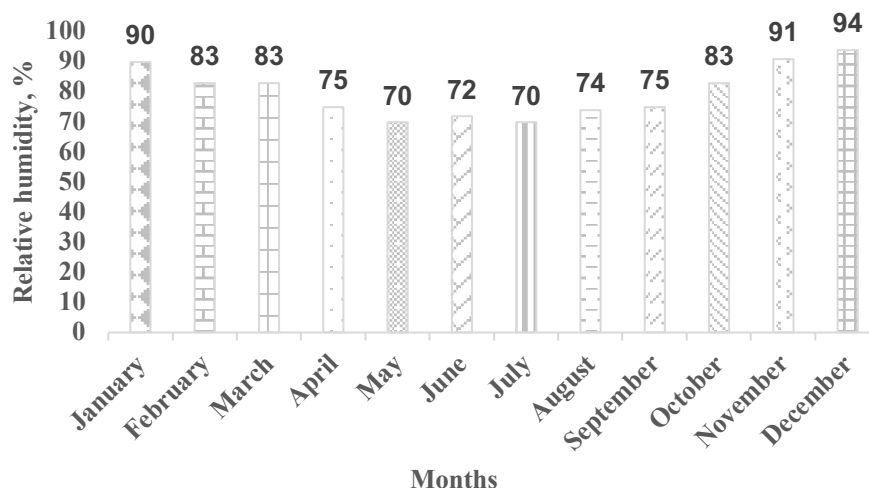


Figure 3. Relative Humidity, %.

The microclimate of this area will have a favorable effect on the nursery, making it an ideal place for growing seedlings of various trees and shrubs.

The economy of the region is constantly developing, which improves the well-being of its residents. The diversity of economic sectors makes the city resilient to external economic shocks, ensuring its stable growth.

Light industry can be called the leader among the sectors of the city's economy, since its share in the total production volume is 46%. Mechanical engineering also plays an important role in the city's economy, accounting for 34.4% of the total production volume. The food industry ranks third in terms of its share in the total production volume, with 27%.

Lebedyn Community can be proud of its forests, which occupy a significant part of its territory - 32.9 thousand hectares, or 21% of its total area. The forestry of the community is conducted at a high level, since it has everything necessary for this - production facilities and qualified workers. The forestry enterprise employs 180 people who take care of the preservation and multiplication of forest resources. Every year, 100 hectares of forest are restored in the community, which indicates a responsible attitude to the environment. Thanks to the work of foresters, the forests of the Lebedyn community not only provide people with timber, but also have important environmental and recreational significance. Forests are a real decoration of the community, a place of rest and a source of inspiration for people. The local authorities are doing everything possible to preserve and multiply forest resources. The forests of the Lebedyn community are our common wealth, which we must preserve and multiply for future generations.

The organizational and economic plan is the basis for the successful functioning of the nursery. It determines the organization, technology and direction of the nursery's activity for a number of years.

The organization of nurseries is based on the principle of separate cultivation of individual species of planting material. This principle has a number of advantages, such as:
1. Better control over growing conditions, different types of seedlings have different needs

for light, moisture, temperature, and soil. Separate cultivation allows you to create optimal conditions for each type, which leads to better growth and development of plants. 2. Reduced risk of spreading diseases and pests, some diseases and pests affect only certain types of plants. Separate cultivation helps to isolate infected plants and prevent the spread of infection to other species. 3. Efficient use of resources, separate cultivation allows for the maximum use of available resources, such as water, fertilizers, and land. 4. Convenience of care, separate cultivation makes it easier to control the quality of planting material. 5. Easy quality control, Separate cultivation makes it easier to control the quality of planting material, since it is immediately visible whether the seedlings meet the specified parameters. 6. Possibility of specialization, nurseries can specialize in the cultivation of certain types of seedlings, which allows them to perfectly master the technologies and obtain high-quality planting material. 7. Preservation of varietal characteristics, cross-pollination can lead to changes in varietal characteristics. 8. Obtaining better planting material: Separate cultivation allows seedlings to become more resistant to adverse conditions, have a better developed root system and crown, which makes them more suitable for planting. 9. Expanding the range of planting material, separate cultivation allows for the cultivation of a wide range of species and varieties, which meets the diverse needs of gardeners.

The division of the nursery area into departments, sections, and nurseries with separate cultivation of planting material is an important condition for obtaining high-quality planting material.

The production part will consist of one sowing department, two nurseries - decorative and fruit (school department) and a mother plantation. The sowing department is planned to grow seedlings of large-leaved lime. The decorative nursery will grow seedlings of oriental thuja, and the fruit nursery will grow seedlings of common pear.

The sowing department is the foundation for growing high-quality planting material and goes through the first stages of its development, associated with the formation of the root system and the formation and development of the above-ground part of plants. The calculation of the sowing department area is shown in Table 1.

Table 1. Area of the Sowing Department.

№	Breed name	Seedling growth period, years	Annual planned seedling release, thousands of pieces	Number of fields in the crop rotation, pieces	Number of fields allocated annually for sowing of a given breed, pieces	Seed sowing pattern	Planned seedling yield per 1 running meter, piece	Area of the sowing department, hectares	
								Total	Size of one field
1	Large-leaved lime	2	990	3	1	30x30x30 x60	25	6,8	2,3

According to the planned task, seedlings of large-leaved linden are planned to be grown for two years. There will be three fields in the crop rotation. Each year, one field will be allocated for sowing of the tree species. The planned yield of seedlings from 1 running meter of the furrow is 25 pieces, taken from the methodological instructions (Surgan O.V., 2019, p. 24). The annual planned release of seedlings according to the planned task was 990 thousand pieces. The number of seedlings grown annually, taking into account the loss, is 1138.5 thousand pieces. According to our calculations, the total area of the sowing department was 6.8 hectares. Accordingly, the area of one field was 2.3 hectares.

One- or two-year-old plants (seedlings, rooted cuttings), less often three-year-old plants, are transplanted to nurseries for further cultivation. In this department, the planting material is grown to commercial condition. The seedlings reach the optimum size and age. The crown is formed with the help of special pruning. The calculations of the area of the school department are located in Table 2.

Table 2. Calculation of the area of the school department.

№	Breed name	Cultivation period, years	Annual seedling release, pieces	Growing period culling, pieces	Number of seedlings to plant, considering expected losses, pieces	Layout plan, m ²	Feeding area per seedling, m ²	Number of fields in the crop rotation, pieces	Area under the breed in the department, ha	Area of one crop rotation field, ha
Tree nursery (ornamental)										
1	Oriental Arborvitae	2	150 00	225 0	17250	1,0x 0,5	0,5	3	2,58	0,86
Fruit tree nursery										
2	Common Pear	2	170 00	340 0	20400	1,0x 0,5	0,5	3	3,06	1,02
Total			-	-	-	-	-	-	5,64	

To obtain an annual planned harvest of 15,000 Oriental Arborvitae seedlings with a feeding area of 0.5 m², it is necessary to plant 17,250 seedlings. Seedling cultivation is planned for two years. After the calculations, the total area under the breed in the department was obtained - 2.58 hectares. The area of one field will be 0.86 hectares.

According to the calculations, a total area of 3.06 hectares is required for growing Common Pear seedlings. There will be three fields in the crop rotation, so the area of one field will be 1.02 hectares. In total, the area of the nursery department will be 5.64 hectares.

The mother stock department serves for the propagation of woody plants. The quality and diversity of green spaces depend on the work of the mother stock department. The mother stock department has the following functions: 1. Collection of generative material (seeds), for this purpose, mother plants are grown to obtain high-quality seeds with the desired characteristics; 2. Collection of vegetative material (offsets, cuttings), vegetative propagation is used to create new plants that are genetically identical to the mother plant. The area of the mother stock plantation is determined according to calculation table 3.

Table 3. Calculation of the area of the mother stock plantation.

Breed name	Plant spacing, m		Feeding area of one plant, m ²	Number of plants per 1 ha, pcs.	Planned cutting yield from		Planned target for cutting collection	Plantation area, ha
	In a row	Between the lines			Per plant, pieces	1 ha, pieces		
Weigela florida	0,5	1	0,5	20000	10	200000	35000	0,175
Total								X

The mother plant department will have one field. The feeding area for one plant is 0,5 m². The planned yield of cuttings from one plant is 10 pieces, and from one hectare 200,000 pieces. The planned annual cutting production will be 35,000 pieces. According to our calculations, the area of the plantation will be 0,175 ha.

The auxiliary part includes: Roads, Forest strips, Farm yard, Outfield, Fence, Reservoir.

The calculations of the auxiliary area are shown in Table 4.

Roads in the nursery connect different parts: departments, nurseries, fields. They ensure smooth operation and create convenience for people. Three types of roads are planned in our nursery: circular, main and auxiliary.

Main and circular roads should provide the possibility of turning cars and aggregates, so their width within our calculations was 8 meters. For auxiliary roads, a width of 5 meters is taken, and they are cut along the long sides of the fields and are used for the passage of cars and aggregates in one direction. The total area under roads is 2,42 hectares.

Table 4. Calculation of the auxiliary area of the nursery.

№	Auxiliary section name	Size, m ²		Area, ha
		Length	Width	
1.	Roads	-	-	2,42
	a) Ring road	1800	8	1,44
	b) Main road	690	8	0,552
	d) Service roads	860	5	0,43
2.	Forest strip	1800	5	0,9
3.	Household plot	-	-	0,5
4.	Field plot	-	-	0,74
5.	Fence:	1800	0,5	0,9
6.	Water body			0,74
Total		-	-	

Shelterbelts are created on the outside of the circular road, and sometimes within them on large nurseries, to protect fields from the harmful effects of winds, especially dry winds. The protective strip is created from fast-growing species of trees in a shade-tree type of mixing with 3-5 rows. The distance between the rows is 1,5-2 m, and the width of the edges is 1,0 m. Our organizational and economic plan also includes a shelterbelt, which will be 5 meters wide and have an area of 0,9 hectares.

A fence (hedge) is planted on the outside of the shelterbelt at a distance of 1,5 m from it with one or two rows of thorny shrubs or trees that tolerate pruning. It serves to protect the nursery from the entry of strangers, domestic and wild animals. The planned width of the fence is 0,5 m, and the area is 0,9 hectares.

An area of 0,5 hectares is allocated for the господарственная ділянка, which is divided into two sectors: production and residential. The following facilities are located on the: an office, a building for seed storage and stratification, a garage, a storage facility for inventory and equipment, warehouses and other production facilities. The diagram of the organizational and economic planning scheme is located in Figure 4.

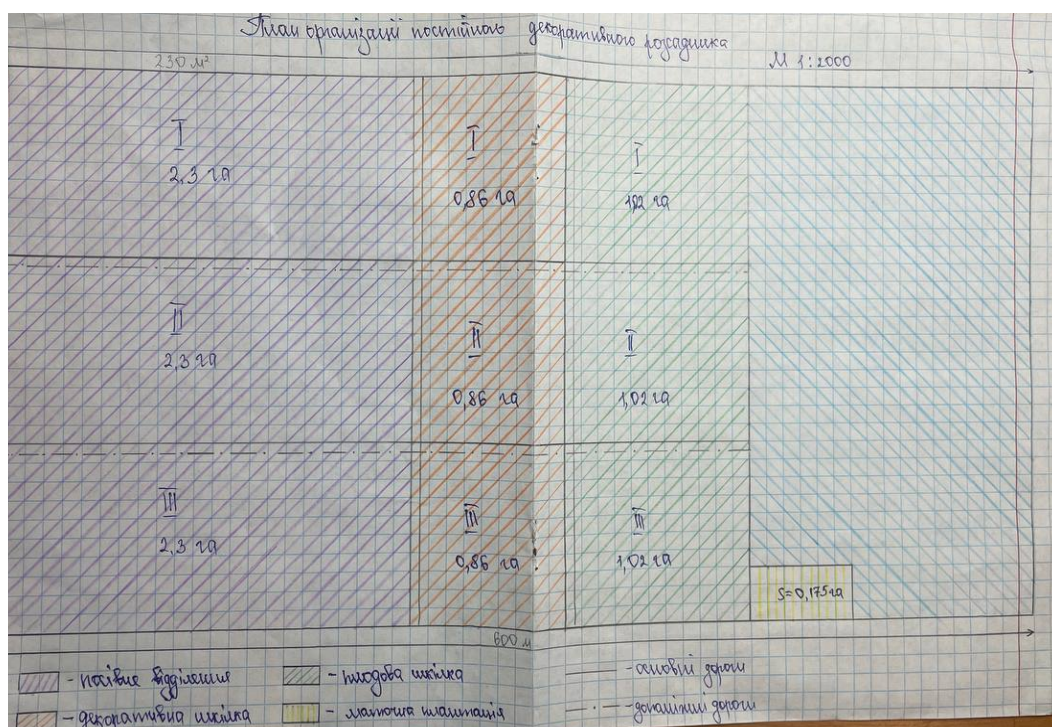


Figure 4. Organizational and Economic Plan of a Permanent Ornamental Nursery State Enterprise «Lebedynskyi Lishoz».

The auxiliary area will also include a 0,74-hectare experimental plot and a 0,74-hectare reservoir.

The land organization plan is drawn to a scale of 1:2000 and is accompanied by appropriate labels and an explication. The production and auxiliary parts of the nursery are first drawn on a sheet of graph paper. Then the dimensions of the auxiliary part are determined on the plan and its area is calculated.

The practice of rotating crops in a specific sequence on the same land over a period of time offers several benefits. Therefore, crop rotation is used to preserve and increase soil fertility, restore its structure, accumulate moisture, and clear fields of weeds, diseases, and pests.

After growing leguminous crops on the area, which enrich the soil with forms of nitrogen available to plants, it is advisable to plant (sow) plants that are demanding on the nitrogen content in the soil in their place. After crops that deplete the soil, it is necessary to place such crops (after fertilization) that contribute to the restoration of fertility.

Crop rotation involves dividing the area of production departments (seedling, school) of the nursery into a certain number of equal-sized fields. In our organizational and economic plan, both departments have a three-field crop rotation, which is presented in tables 5, 6, 7.

Table 5. Crop rotation plan for the seedling department of the Lebedinsky District State Enterprise permanent decorative nursery.

Years of use	Field No		
	I	II	III
2018	Pair black + herbicides		
2019	Al	A/C	Al
2020	A/C	Al	YP1
2021	O/f	YP1	YP1+ YP2
2022	YP1	YP2	O/f
2023	YP2	O/f	YP1

Notation: Al – Annual lupin; A/c – Agricultural crop; YP1 – young plants of the first year of cultivation; YP2 – young plants of the second year of cultivation; O/f – Occupied fallow; YP1+ YP2 – young plants of the second and first years of cultivation.

Table 6. Crop rotation of a permanent ornamental nursery for the ornamental department of the Lebedinsky District State Enterprise.

Years of use	Field No		
	I	II	III
2018	Pair black + herbicides		
2019	Al	A/c	Al
2020	A/c	Al	S1
2021	O/f	S1	S2+ S1
2022	S1	S2	Al
2023	S2	Al	A/c

Notation: Al – Annual lupin; A/c – Agricultural crop; S1 – Seedlings of the first year Seedlings of the first year; S2 – Seedlings of the second year of cultivation; O/f – Occupied fallow; S2+ S1 – Seedlings of the second and first years of cultivation.

Table 7. Crop rotation of a permanent ornamental nursery for the fruit department of the Lebedinsky District State Enterprise.

Years of use	Field No		
	I	II	III
2018	Pair black + herbicides		
2019	Al	A/c	W
2020	A/c	W	B/P1
2021	W	B/P1	B/P2
2022	B/P1	B/P2	Al
2023	B/P2	Al	A/c

Notation: Al – Annual lupin; A/c – Agricultural crop; W- wildings; B/P1 – Budded plants of the first year of cultivation; B/P2 – Budded plants of the second year of cultivation.

High-quality soil is the foundation for successful cultivation. Favorable conditions for seed germination, loose soil with small lumps allows air and water to pass through well, which allows the roots of seedlings and cuttings to develop freely. Improvement of soil structure: cultivation helps to get rid of weeds, pests and pathogens, and also improves the water permeability and water retention capacity of the soil. Fertilization during cultivation provides seedlings with the essential elements they need for growth and development. Soil cultivation can be divided into two types: primary land development and cultivation measures in fields of accepted crop rotations. Primary land development includes: land preparation for cultivation. Soil cultivation in fields of accepted crop rotations includes primary and pre-sowing (pre-planting) cultivation. Primary soil cultivation includes the following operations: In autumn - stubble disking with simultaneous harrowing, plowing after weeds emerge; In spring - early spring harrowing.

Pre-sowing soil cultivation may include the following techniques: spring plowing, cultivation, harrowing, dragging, rolling, tilling, making ridges.

Conclusions. The city of Lebedin has a significant natural resource potential, which has a positive impact on the development of the national economy, industrial enterprises and agriculture.

A favorable climate, fertile soils and the presence of minerals give this region a significant potential for economic growth. Local residents have the opportunity to use the gifts of nature to improve their well-being and create new jobs.

The large area of forests has made forestry a key sector of the community's economy. Foresters do a variety of work to preserve and increase the community's forest resources.

Their activities include the following main areas: forest restoration – foresters annually plant new forests in the places of clearings, fires and other damaged areas;

increasing forest productivity – Foresters use special measures to improve the growth and quality of trees.

They improve the growth and quality of trees; organization of forest seed production, foresters collect seeds of forest trees, grow seedlings and carry out reforestation work; improving the condition and increasing the productivity of forests.

The activities of the enterprise are not limited to the restoration and care of forests. Foresters also carry out cuttings of different intensity, which contributes to the thinning of the forest stand and the improvement of its sanitary condition. It is important to note that all logging is carried out in accordance with strict environmental standards and regulations. The company also works continuously to protect forests from fires, pests, and diseases.

In view of the above, it is safe to say that the company has all the prerequisites for creating a successful decorative nursery. The successful geographical location and favorable climatic conditions make this place ideal for growing ornamental plants. The company has access to the necessary resources, such as water, land and labor resources. Experience in forestry and knowledge of forestry are a significant advantage. The creation of a decorative nursery can become a new direction of development for the enterprise, which will bring additional profit. A decorative nursery can be a real gem for a community and can attract tourists. The creation of new jobs is also an important factor. Taking into account all these factors, it can be concluded that the creation of a decorative nursery on the basis of the enterprise is advisable and promising. To implement this project, it is necessary to attract the necessary investments, and provided the right approach and competent management, this project will be successful.

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CURRENT TRENDS IN COMPUTER DESIGN OF GARDEN AND PARK FACILITIES

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Introduction.

The field of landscape architecture is undergoing a significant shift towards the integration of modern computer technology. Computer-aided design, which was once limited to architectural drawings and interior planning, has now expanded to the design of garden and park facilities. The art of landscape design has come a long way. Historically, it was a manual process that relied on the experience and artistic vision of landscape architects. Today, computer-aided design tools have revolutionised the industry, allowing designers to create complex and accurate plans. The evolution of computer-aided design (CAD) systems in the design of gardens and parks is testament to the growing importance of this technology. The use of computer tools for designing open spaces has a rich history dating back to the late 20th century. Initially, CAD systems mainly served as drawing tools, allowing designers to create two-dimensional plans more efficiently. However, over time, CAD software has evolved into sophisticated platforms that are capable of performing 3D modelling and data-driven analysis. Computer-aided design offers numerous benefits to professionals, including increased accuracy, speed and cost-effectiveness. It allows designers to experiment with different concepts, improve their designs, and visualise the end result more effectively.

Modern CAD systems have shifted the focus from 2D drawings to 3D modelling, allowing designers to create more realistic representations of gardens and parks. These models not only improve visualisation, but also aid decision-making and communication with stakeholders. CAD software now also allows for effective analysis of environmental impact, water management and plant selection to create more environmentally friendly and sustainable outdoor spaces. At the same time, augmented reality (AR) has become a valuable tool for designers, giving them the ability to quickly overlay digital models on the physical world. This technology provides real-time visualisation and interaction with proposed projects in their real environment, facilitating better decision-making and public engagement. Modern CAD tools have greatly facilitated public participation in the design process. Virtual tours, online platforms and interactive models allow communities to participate in decision-making and provide valuable feedback.

As urbanisation and environmental concerns continue to grow, the integration of artificial intelligence (AI) into landscape design is becoming increasingly important. In recent years, the use of artificial intelligence in CAD has revolutionised the way we design and create garden and park facilities. Therefore, AI-based generative design has become a powerful tool for landscape architects. It involves the use of algorithms and machine learning to create many design options based on