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@ Correspondence author
M. M. Guz
mguz@ukr.net

M. M. Guz

Ukrainian National Forestry University, Lviv, Ukraine

Mykola Guz,
Dr. Hab., Professor,
Email: mguz@ukr.net

CURRENT PROBLEMS OF SILVICULTURAL PRODUCTION IN UKRAINE AND THE WAYS OF THEIR SOLUTION

Silvicultural production comprises three components: forest-seed production, forest seedling and silvicultural industry. Both achievements, as well as certain problems and shortcomings are inherent to each of these components. Therefore, this work is devoted to the analysis of these issues. The aim is to generalize the problems of modern silvicultural production in terms of its components and the search for their solutions in the context of the existing national and international achievements of the theory and practice of artificial regeneration of forest stands. It is established that domestic forest-seed production is characterized by insufficient number and area of objects of permanent forest-seed base (primarily clonal seed orchards and family forest-seed plantations of plus and elite trees). Therefore, these sites produce no more than 10-12 % of forest-seed raw material.The procurement of forest-seed raw materials is not always carried out in compliance with the principles of forest typology and forest-seed zoning. Current forest-seed zoning in Ukraine needs to be improved. The legislative basis of Ukraine in the field of forest seeding must be synchronized with analogous documents of the EU countries. Intensification of the forest planting material cultivation in our country should be carried out through under-cover growing of planting material, with a root-balled tree system and *in vitro* culture. In recent years some forestry enterprises, in order to grow forest crops, have begun to use the modern technology for establishing forest plantations (application of superabsorbents and moisture accumulation compounds, plant growth regulators, planting material with root-balled tree system, etc.), thereby increasing the survival rate and growth of crops. An analysis of the current problems of forest-culture production in our country suggests that, despite the limited funding, forestry practitioners and scholars of the research institutes and higher educational institutions are making considerable efforts with regard to maintaining practical forestry at a proper level, which has a long history in our country. The full or partial solution of the problems mentioned above will facilitate the intensification of all components of silvicultural industry, which will result in increased productivity and increased biotic resistance of artificial forest stands created for different purposes, using various species and varieties in all silvicultural zones of the country.

Keywords: silvicultural productions; sowing quality of seeds; forest-seed zoning; forest-typological arguments in favour of forest-seed raw materials harvesting; silvicultural zoning.

Introduction

At the present stage of forest industry development in Ukraine, reforestation takes place in natural, artificial and combined ways. At the same time, the artificial way of regeneration – by creating forest cultures, has dominated since the beginning of the 1950s, despite the gradual increase in the share of natural reforestation in the last 15-20 years. The priority of artificial regeneration in the country is caused by a number of natural and historical reasons (low percentage of forest land, large amount of afforestation in sparsely forested areas, large areas of forest plantations and relatively poor site conditions where there is no natural regeneration of forests, Etc.)

The history of artificial reforestation in the territory of modern Ukraine dates back to BC era, however, the intensification of this trend has begun during the last three hundred years (Gordienko, 2005). This period of artificial reforestation has common features in history and traditions for Ukraine, Austria, Romania, Hungary, Slovakia and Poland (in the western regions of the country), and Russia (in the central and eastern regions of the country).

Creating artificial forest stands in the country is conducted in five areas: reforestation, afforestation, protective afforestation, conversion of subsidiary crops by silvicultural activities and forest recultivation. The above mentioned activities are regulated by the state standard DSTU 2980-96 (1996). A share of each area in the total volume of artificial reforestation corresponds to the given sequence of the activities.

Silvicultural production comprises three components: forest-seed production, forest seedling and silvicultural industry. Both achievements, as well as certain problems and shortcomings are inherent to each of these components. Therefore, this work is devoted to the analysis of these issues.

The aim of the work is to generalize the problems of modern silvicultural production in terms of its components and the search for their solutions in the context of the existing national and international achievements of the theory and practice of artificial reforestation of forest plantations.

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Presentation of the main research material

Forest-seed production in silvicultural production occupies a special place, since its main task is to provide forestry enterprises with forest seed with valuable hereditary properties and high sowing quality and the use of seed surpluses for sale to other forestry enterprises (including entrance of forest seed products to the markets of other regions or countries). The success of the subsequent stages of silvicultural production depends entirely on the quality of the forest seeds. The 10-15 % increase in productivity of artificial cultivation of forest crops can be achieved only due to the use of seeds with valuable hereditary properties and high sowing quality, with other equal technological conditions, (Debryyuk, et al., 1998).

In order to obtain seeds of such high quality in sufficient quantities, it is necessary to ensure a high technological level of works performance at all stages of forest-seed production (creation and formation of objects of a permanent forest-seed station, harvesting and processing of seed raw materials, quality storage of seeds, prepearation of seeds for sowing, etc.).

Primarily the preparation of seed raw materials should occur at the objects of the of the permanent forest-seed establishment of forest enterprises, with the observance of the principles of forest typology and forest-seed zoning, in due time, and with the use of appropriate technologies and methods of harvesting. Such harvesting should be carried out from the growing trees of coniferous and deciduous species by picking cones and fruits, or by collecting the material, for certain types of angiosperm, from the surface of the soil. The objects of the permanent forest-seed establishment should play a key role in the procurement of forest-seed raw materials, requirements to which are set out in a number of normative documents and educational and scholarly works (Sectoral program, 2010; Forests of Ukraine, 2002; Debryyuk, et al., 1998; Jacyk, Deineka, Parpan, 2006; Guidelines, 1993; Suszka, 2000). Unfortunately, at the obects of the permanent forest-seed establishment of state-owned forestry enterprises, no more than 10-12 % of raw material is produced, although these raw materials are the source of obtaining the seeds of higher selection categories – improved, certified, hybrid and elite. The remaining forest-seed raw materials harvested at temporary forest-seed establishments from normal forest crops, etc. produce only normal seed. Seeds of this breeding category, in terms of breeding perspective, are the least valuable out of the list of varieties that are allowed for the creation of artificial forest stands.

The reason for such insignificant volumes of harvested forest-seed raw material on the objects of the permanent forest-seed establishment is the small number and insufficient area of these objects (primarily clonal and related forest-seed plantations, plus and elite trees).

The situation with the harvesting of high-quality forest-seed raw material at the forestry enterprises of other ministries and departments is even worse. For example, there are no objects of the permanent forest-seed establishment in the structure of regional subsidiaries of the *Halsillis* municipal forest enterprise (Lviv Region) with a total area of 146.5 thousand hectares. That is, in the present economic environment of the forestry sector, the base quantity of cultivated plant material used in the creation of artificial forest stands, unfortunatelly, is grown from seeds of low genetic quality. At the same time, due to the irregular occurence of good seed years for the most valuable forest-forming species (Common oak, Common beech) and, correspondingly, the shortage of seeds in certain years, the principles of forest-seed zoning are not always followed during the cultivation of planting material. However, even the positive impact of a clear forest-seed zoning compliance during the procurement of forest-seed raw materials and regionalization of the forest seed might fairly easy be negated through improper storing or preparing it for sowing (Gordienko, 2005).

Requirements for ensuring the regime of storage are relevant both for raw material and for already processed seeds. Storage of seed raw materials (cones in conifers, fruits or seeds in angiosperms) should be carried out at appropriate temperature and humidity, starting from the time of completion of the preparation to the beginning of the processing. Failure to comply with these requirements causes a decrease or total loss of seed viability. Of particular importance is the seed material with a high content of moisture at the time of its harvest (various species of oak, Silver fir, etc.). However, for all other forest-seed raw materials of other forest species, this requirement is also relevant. After all, the violation of the regime of storage, in addition to the viability decrease, is accompanied by infection with various diseases, which also significantly affects the seed quality. In the process of harvesting of forest seed raw materials, it is important to reduce the time of delivery to the place of processing, where, as a rule, there are appropriate conditions for controlled storage prior to processing.

Ensuring the quality storage of processed and cleaned forest seed is equally important. The amount of such seeds in the crop year at the enterprises can be hundreds of kilograms of conifers or dozens of tones for individual broadleaved species (Common oak). Of course, the majority of forestry enterprises are not able to provide, even short-term, high-quality storage of such an amount of forest seed. Failure to comply with the storage regime is due to the insufficient number of modern seed storage facilities. And the available ones are not always used efficiently because of the reluctance of the management of the forestry enterprises to bear additional costs of paying for the storage of seeds.

In order to specify the problem of ensuring the quality storage of forest seeds, it is expedient to give data on the production activities of the State Forestry Enterprise "Lviv Forest Selection and Seed Center". The section for processing and storage of forest seed raw materials and forest seeds at the State Forestry Enterprise "Lviv Forest Selection and Seed Center" is the only place in Ukraine that uses relatively modern technologies for mass processing of forest seed raw materials of coniferous species. The existing equipment of this workshop makes it possible to successfully process seeds of different varieties of pine, fir, larch, Douglas fir, etc. It is worth noting that this is the only enterprise in Ukraine, whose workers mastered machine processing of cones from fir trees. The production capacities of the enterprise provide for processing up to 130-150 tons of forest seed raw materials of coniferous species per year. Such an amount of forest seed raw materials can meet the needs of forestry enterprises of all forms of ownership in, at least, four to five administrative regions of Ukraine. And the enterprise's refrigerating chambers with a total capacity of 64 m^3 provide for short-term and long-term storage of up to 20 tons of seeds under controlled conditions with a minimum decrease in seed quality. The equipment of this enterprise allows using modern foreign technologies, which

provide for the possibility of long-term storage of forest seeds (up to 10 years and more) of such species as Common beech, Common oak and all coniferous. Performance capabilities of these technologies, in addition to controlled humidity and temperature conditions, include the possibility of processing the seeds with fungicides, thermal therapy, etc. However, during the period of its operation (since 2007), the enterprise has been loaded no more than 70-75 % on the processing of forest seed raw materials and 5-7 % – on the storage of seeds.

For most species of woody plants, harvesting of forest seed raw materials is carried out by forestry enterprises in accordance with certain terms, described in detail in the relevant literature (Debrynyuk & Guz, 2009; Debryyuk, et al., 1998; Advisor, 2008). Unfortunately, it is impossible to claim that the harvesting of forest seed raw materials is carried out in accordance with the principles of forest typology and forest-seed zoning.

Forest-seed zoning is the division of the natural area of one or another species of forests into relatively homogeneous, according to soil-climatic factors, parts in order to provide the most effective support for the use of the genotype potential of seed raw materials in silvicultural production (Debryyuk, et al., 1998; Gordienko, 2005).

Modern forest-seed zoning in Ukraine is developed for the seven most common tree species, capable of forming pure natural and artificial forest crops (Scots pine, Norway spruce, Silver fir and European larch (conifers), and Common oak, Common beech and Crimean beech for broaleaved species). It is, actually, a copy of "Forest-seeded zoning of the main forest-forming species in the USSR" (Forest-seeded, 1982). The authors of this zoning took into account the then-existing state borders. Thus, the boudaries of forest-seed zoning in the western administrative regions of Ukraine were artificially limited by the state border. Obviously, this shrinked the boundaries of forest-seed zoning areas of all the forest-forming species listed above, with the exception of the Crimean beech, and legally prevented the use of seeds of high-yielding populations from other neighbouring countries.

Introduced in 1993, "Guidelines on forest seeding" (Guidelines, 1993) have inherited and adopted at the regulatory level the developed zones for the forestry industry of an already independent Ukraine, which is still valid today. We claim that this forest-seed zoning is faulty for several reasons. Firstly, a number of important for our country forest-forming species such as Swiss stone pine, Sessile oak, Pubescent oak, Norway maple and Sycamore, European ash, Silver birch and others had been left outside.

Secondly, the specified forest-seed zones are not justified with regard to their territorial size. First of all, this is true for the main forest species such as Pine and Common oak. Thus, for the Pine, the most common type of forest-forming coniferous tree, forest stands of which occupy an area of more than 3.0 mln. hectares (Normative, 1987), it is allocated only six forest-seed zones. This is not enough for such a large area (in the neighbouring Poland, with approximately the same area of forests, 25 forest-seed zones are allocated for Scots pine). Since, according to the zoning requirements, it is permitted to use seeds from adjacent areas for artificial reforestation of forest-seeding regions, this a priori means that pine seeds can theoretically disperse at a distance much greater than it is permissible in terms of genetic breeding expediency.

The situation with the forest-seed zoning of Common oak is even more complicated. For this specie, nine forest-seed zones are allocated on more than 2.0 mln. hectares (Normative, 1987) of its crops. But unlike pine, the intervals between good seed years for the oak are generally much longer – seven to ten years or more, while the need for planting material of this specie is relatively stable due to the regular main felling. Therefore, to ensure the need for seed for growing seedlings, forestry enterprises often use reproductive material of any origin and low selection value. Harvesting, or rather purchasing, of acorns often takes place not within the boundaries of permissible forest-seed zones, but where there is a crop. Usually, the seed crops of Common oak are more often observed in poorer forest growth conditions. Such conditions are common for the Polissya, where the subor ecotype Common oak is common. In turn, the use of oak's acorns of subor ecotype for artificial reforestation in forest-steppe zone, where grow the most highly natural and artificial stands of this species, is undesirable, since this species has an inherent ability to form edatopes and phenological forms, which are characterized with a high level of adaptation mostly to particular natural and forest land conditions. The consequence of such use of alien reproductive material in most cases will be the negative forestry effect in the form of productivity loss in artificially grown oak crops, and reduction of their biotic resistance.

The scale of forest-seed zoning, developed for other forest-forming species, is less important because of their limited area occurrence (Norway spruce, Silver fir, Common beech and Crimean beech) or of a small amount of plant material used (European larch).

Thirdly, the existing forest-seed zoning makes it impossible to officially and legally use seeds of high-yielding populations of a number of forest species (Common beech, Sessile oak, Pubescent oak, European larch, Pine, Norway spruce, Silver fir, etc.) from neighbouring countries (Danchuk, 2012). In Ukraine, the listed species grow, with the exception of the Pine, usually, on the eastern border of their habitats. And, possibly, the use of seeds of these species from near-centre parts of the habitats would enable the creation of higher-productivity trees and biotic stability.

The organization of a more perfect scheme for forest-seed zoning is a long process with the involvement of a wide range of specialists and allocation of necessary budget funding. The future positive forestry and economic effect of such zoning is, in our opinion, a significant argument in favour of the elaboration and improvement of existing forest-seed zoning.

Adopting the course of silvicultural production in our country on a typological basis involves the use of forest typology principles in forest-seed production as well. And this has already been partially reflected in the recommendations of practical application for the creation of forest-seed plantations and the use of forest seeds collected from them (Guidelines, 1993). As for the current legal, scholarly and practical works on forest-seed production, there are no specific recommendations on forest typology study and substantiation of procurement of forest-seed raw materials and use of forest seeds outside the permanent forest-seed establishments, which now significantly dominates in the total volume of harvested seed. This leads to uncontrolled use of forest seeds in a wide range of forest growth conditions, which does not always contribute to the optimal use of their potential. This aspect requires additional long-term re-

search in the context of specific forest-forming species. However, we provide empirical evidence that allows us to propose harvesting of seed raw materials and using forest seeds for silvicultural production of forest-forming species in appropriate types of forest growth conditions (with hygrotopes being taken into consideration). Harvesting of seed material and its subsequent processing should be carried out separately within each of the specific types of forest growth conditions located in Ukraine (A_0, A_1, A_2, A_3, A_4, B_0, B_1, B_2, B_3, B_4, C_0, C_1, C_2, C_3, C_4, D_0, D_1, D_2, D_3, D_4). In wet types of forest growth conditions (A_5, B_5, C_5, D_5), it is not advisable to harvest forest-seed raw materials, since in these conditions, the creation of forest crops is not provided by existing regulatory documents.

As for technological aspect, within the examined types of forest growth conditions, the organization of harvesting and processing of seed material outside forest-seed permanent establishment facilities (in normal and temporary planting areas) is technically and organizationally possible. To do this, one should provide control over the origin of the forest seeds material. Also processing and subsequent storage of forest seeds should be carried out separately for each type. Typically, in a specific forest district and forestry enterprise of different forest areas, the number of types of forest growth conditions, in which the harvest of forest seed raw materials is carried out, is limited by their insignificant amount for one or another forest species. For Polissia region, where pine dominates in forest seeds harvesting, these are pine and subor forests types of forest growth conditions and with higrotopes ranging from dry (often very dry) to wet; or subor forests types– for Common oak. In the forest-steppe zone, the usual type for common oak is fertile site type. In the mountainous and foothill forests of the Carpathians, prevailing are fairly fertile site types within the boundaries of fresh and moist hygrotops. And the remaining types of forest growth conditions for harvesting forest seeds are utilized much less frequently.

Harvesting and processing of forest-seed raw materials on operating permanent forest-seed establishments is carried out in those types of forest growth conditions where they are present (Guidelines, 1993).

Use of forest seed for the purposes of silvicultural production is allowed within the following groups of related types of site conditions, A_0-A_1, A_2-A_3, A_3-A_4, A_0-B_0, A_1-B_1, A_2-B_2, A_3-B_3, A_4-B_4, B_0 -B_1, B_2-B_3, B_3-B_4, B_0-C_0, B_1-C_1, B_2-C_2, B_3-C_3, B_4-C_4, C_1-C_2, C_2-C_3, C_3-C_4, C_0-D_0, C_1-D_1, C_2-D_2, C_3-D_3, C_4-D_4, D_0-D_1, D_2-D_3, D_3-D_4. When using seeds from adjacent types of forest vegetative conditions, it is permissible to transfer seeds from poorer trophotopes to more fertile ones, and, accordingly, from dry hygrotopes – to wetter. The use of seeds in reverse order is undesirable.

Processed seeds are used in two ways for forest cultivation consideration: directly for the creation of forest crops by sowing and for growing seedlings in forest nurseries. The former is practiced for the creation of forest crops of species with large seeds (various types of oak and walnut, Sweet chestnut, Horse chestnut, etc.). But the base quantity of seeds of most species is sown in open and closed soils of the seedbeds of forest nurseries for growing seedlings with an open and closed root system.

The main source of supply of planting material for domestic silvicultural production is still the open area of the seedbeds of forest nurseries. Therefore, the development of ways to intensify the cultivation of planting material remains one of the important problems of forest-culture production. In our opinion, the development of ways to intensify the cultivating of planting material should be based on the existing classical methods (growing seedlings and seedlings with an open root system in open or closed soil) and more modern (production of seedlings with a closed root system and tissue culturing) methods.

As for the intensification of the growing of planting material in conditions of open soil, the most important elements of this process are the following: high-quality preparation of seeds for sowing, pre-planting processing of seeds and seedlings with growth regulators (thymine, emistome, andwin, vermistym, sodium humate, zircon, agrostimulin, fumar, etc.), and with growth stimulants (agrostimulin, charcor, etc.). Of course, all of these measures should be used in combination with qualitative and timely conduction of classical agrotechnical methods of soil cultivation, using various fertilizers, ensuring quality seeding and care for crops, sprouts and seedlings, control for diseases and pests, etc. (Vedmid, Yatsenko & Popov, 2002; Vocelko, et al., 2005).

The cultivation of forest stock material with a closed root system is one of relatively new and promising areas of forest-culture production, the history of which dates back to the 1960s when, almost simultaneously, in many countries the industrial production and testing the characteristics of the growth of planting material in variously designed and of various size, individual and multi-cell containers was launched.

The main forestry and economic preconditions for development of this trend are the possibility of significant extension of the terms of silvicultural work and increase in the survival rate of the planting material, better use of the selected seed material, while simultaneously significantly reducing the amount of used seed, the wide use of fertilizers and growth stimulants, etc. Another advantage of using the planting material with a closed root system is the absence of injury or damage to the root system of the plant, which is inevitable when growing seedlings in open soil. When growing seedlings in the open soil, damage to the root system occurs during agrotechnical care, formation of the root system by cutting the tap root, excavation of the seedlings, its multiple heeling-in and transporting to the permanent place of growth.

In Ukraine, the cultivation of planting material with a closed root system in forest nurseries of various forest growth conditions in industrial volumes began in 2005. Additionally, the main types of containers used are multi-cell and individual. As for the multi-cell containers, 53 and 74 cellular foam containers of French and domestic production and multi-cell polymer containers with different number of cells are the most widely used. As for the individual containers, peat batches of various sizes and container-sleeves, made of polyethylene film, or more precisely, from a film sleeve of different diameters and lengths, have been widely used in growing forest seedlings.

The perspective direction of the intensification of growing seedlings is the use of the container production (container nursery). Such a trend in the cultivation of planting material has become widespread in the last 20-30 years in European countries (Szabla & Pabian, 2003). Container production makes it possible to grow seedlings without contact with the soil, but with the provision of the whole production cycle with a high level of mechanization and computerizati-

on. Unfortunately, in the forestry of our country so far there is no such production of gardening material.

In the system of measures to intensify the cultivation of planting material, a separate place takes the application of tissue culturing method. Thanks to the specially selected composition of the nutrient mediums and especially the use of specific growth hormones, this method makes it possible to influence the morphogenesis, the course of development of plants, and the degree of multiplication of the source material. When applying this method, you can get tens of thousands of plants per one explant per year. However, for the main forest species these processes have certain peculiarities that are still not studied enough. At the same time, the activity of forestry industry that specializes in the cultivation of forest planting material should be aimed at the practical use of existing developments in this area of forest seedlings breeding. The development of a highly effective method for micropropagation of the main forest species in Ukraine in the near future will enable: to obtain the required amount of seedlings, irrespective of the periodicity of fruiting (seeding) of trees; obtain the planting material genetically identical to the original plant; the possibility of rapid reproduction of valuable clones of plants on small plots, with less electricity and labour expenditures; the possibility of obtaining in large numbers a vegetative offspring of plants that are difficult to propagate by seed; to ensure reproduction of seedlings without removing them from the juvenile phase; the ability to create new species and so on. (Kalinin, Kushnir & Sarnatskaya, 1992).

The experiments, conducted over the past 10-15 years with the cultivation of forest planting material by tissue culture (Grechanyk, 2000; Guz, Grechanyk & Guz, 2007; Zhuk & Karpinsky, 1993; Polyakova, 2006) enabled to draw conclusions about the possibility of widespread use of modern technology for mass production of seedlings of forest-forming species. The limiting factors that are still constraining the use of micro clonal propagation of seedlings on an industrial scale are certain complexity of the technological process and high production costs.

Summarizing the above, intensification of cultivation of forest planting material in our country has significant opportunities in virtually all areas of silvicultural industry. At the same time, the amount of planting material grown under intensive technologies remains insufficient, despite the intensification of the process in the last 10-15 years.

In numerical terms, the largest number of planting material grown in forest nurseries is used to create artificial forest plantations – forest crops. The largest areas of forest crops are created in the spring during artificial reforestation by planting. Over the past 20 years, forestry structures of all ministries and departments of Ukraine annually have created 41.3-70.0 thousand hectares of forest plantations. Approximately 206.5-350.0 million units of seedlings and saplings of the forest-forming and associate forest species were used for this purpose. Usually, forest plantations are planted manually using the Kolesov sword, shovels or planting hatchets. For planting seedlings with closed root system, one might use special manual devices: from planting pipe, Finnish production planting tool "Pottiputky", special attachment (bores) to chain saws or wheeled tractors. The use of forest-planting machinery in the creation of forest crops in recent years is limited. Typically, the use of forest-planting machines is practiced in the creation of forest crops in the Steppe zone, rarely in the Forest-steppe zone and in the Polissya zone, and is not used at all in mountain forests.

The technology of forest crops production in most forestry enterprises has remained unchanged from the middle of the last century. It involves partial (rarely complete) cultivation of a silvicultural land plot, creation of forest plantations by planting seedlings or rarely – by sowing seeds, agrotechnical care before transferring of crops to the ground covered with forest vegetation. At the same time, some forestry enterprises are beginning to use elements of modern technologies when creating forest crops. This involves the use of superabsorbents and moisture accumulators (Teravet, akvasorb etc.), plant growth regulators (Agrostimulin, triman-1, Charkor, fumar) not only during the growing of plant material, but also for growing forest crops, thereby increasing the survival rate and the growth rate of crops (Vedmid, Yatsenko & Popov, 2002; Vocelko, et al., 2005).

Creation of forest plantation in different areas is regulated by relevant normative documents (Instruction, 2010; Rules, 2007; Types, 2010), which takes into account forest growth and climatic features of silvicultural zones and in part are based on the existing silvicultural zoning of the country.

Silvicultural zoning is the marking of the territory of the country or its regions into homogeneous climatic and soil parts with the aim of the subsequent unification of the processes of creation and cultivation of artificial forest plantations of various functional purposes (Forestry, 2014). That is, silvicultural zoning involves the division of the country's territory which could help to ensure the cultivation of artificial forest plantations in forest-culture areas in two ways: general and detailed. Thus, the whole territory of Ukraine is divided into 10 silvicultural regions (Gordienko, 2005). The area of these mega districts ranges from 0.7 to 10.0 million hectares. This zoning serves as the basis for the development of recommended types of forest crops for each zone (Types, 2010). Of course, such a large area of forest-cultivating areas impairs the very purpose of silvicultural zoning. After all, within these areas there are areas, which differ sharply in climatic and soil conditions from the rest of the territory. An example of this is the Small Polissya, which is geographically located within the Western Forest-steppe but differs from the rest of the silvicultural zones by forest growth conditions.

In our opinion, the model of the detailed silvicultural zoning is the zoning of the Western Forest-Steppe, developed by Prof. Yu. M. Debrynyk (Debrynyuk, 2003). For the region of the Western Forest-steppe Ukraine, the author identifies 22 silvicultural zones, united in seven forest-culture districts, which are distinguished by scrupulous detailing of their boundaries (to the level of concrete forestry, or even individual subcompartments). But the author does not confine himself to the allocation of forest and districts, but developed practical recommendations for the whole technological chain of forest crop creation and cultivation for each silvicultural zone (Grechanyk & Bondarenko, 2002).

Less detailed silvicultural zoning (with regard to the silvicultural zones that belong only to the state-owned enterprises) is developed by scholars of the Ukrainian Scientific Research Institute of Mountain Forestry for four administrative regions of the Ukrainian Carpathians (Trancarpathian region, Ivano-Frankivsk-, Lviv- and Chernivtsi regions). Thirteen silvicultural zones,which comprise six silvicultural districts, have been identified within these areas (Advisor, 2008).

The development of detailed zoning for the rest of the forest-cultural mega areas of the country is still waiting its turn. The above-discussed problems of various components of silvicultural industry are generally of technological nature. With appropriate funding and the availability of specialists they can be solved. Next, we provide the most difficult forestry problems to solve in our country, including silvicultural production (Szabla & Pabian, 2003).

The first one concerns the industry's place in the system of executive branch of Ukraine. Over the past 20 years, the role and importance of the forestry industry in the system of executive power has significantly decreased. Until 1997, the Forestry and Hunting Management Administration was the Ministry of Forestry, from 1997 to 2010 – the State Forestry Committee (activity coordinated by the Cabinet of Ministers through the Minister of Environmental Protection), since 2010 – State Agency of Forestry Resources (activities coordinated by the Cabinet of Ministers through the Minister of Agrarian Policy and Food of Ukraine). Such changes were accompanied and are accompanied by a decrease in the status of the industry and, accordingly, the level of general financing of the forestry, including forestry production from the state budget.

The next issue concerns the professionalism of industry leadership. Since 2006, the appointed supervisors in the industry have been individuals without special forestry education, and, hence, without a professional understanding of the problems of forestry industry. A similar situation has occurred at the level of forestry enterprises management and even forest districts in certain administrative areas of the state. Of course, this has not benefited the intensification of forest-culture production. The relatively high level of forest-culture production in our country in the conditions of limited financing is supported mainly due to high civic awareness and professional responsibility and dedication and commitment of engineering and technical workers of the industry.

Conclusions

An analysis of the current problems of forest-cultivating production in our country suggests that, despite the limited funding, forestry practitioners and scholars of the research institutes and higher educational institutions make considerable efforts with regard to maintaining a proper level of the area of practical forestry, which has a long history in our country. The full or partial solution to the problems discussed above will facilitate the intensification of all components of silvicultural industry, which will contribute to increased productivity and increased biotic resistance of artificial forest stands created for different purposes, by different species and types in all silvicultural zones of the country.

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М. М. Гузь

Національний лісотехнічний університет України, м. Львів, Україна

СУЧАСНІ ПРОБЛЕМИ ЛІСОКУЛЬТУРНОГО ВИРОБНИЦТВА В УКРАЇНІ ТА ШЛЯХИ ЇХ ВИРІШЕННЯ

Лісокультурне виробництво в Україні має три складники: лісове насінництво, лісове розсадництво і лісокультурна справа. Кожному з них притаманні як досягнення і здобутки, так і певні проблеми і недопрацювання. У роботі узагальнено сучасні проблеми лісокультурного виробництва у розрізі його складників та пошуки шляхів їх вирішення з урахуванням наявних вітчизняних та закордонних досягнень теорії і практики штучного створення лісових насаджень. Встановлено, що вітчизняне лісове насінництво має недостатню кількість і площу об'єктів постійної лісонасінної бази (передусім клонових і родинних лісонасінних плантацій, плюсових та елітних дерев). Тому на цих об'єктах заготовляють не більше 10-12 % лісонасінної сировини. Лісонасінну сировину не завжди загаловляють з дотриманням засад лісової типології та лісонасінного районування. Сучасне лісонасінне і лісокультурне районування України потребує вдосконалення. Нормативно-законодавчу базу України у сфері лісового насінництва потрібно синхронізувати із аналогічними документами країн ЄС. Інтенсифікацію вирощування лісового садивного матеріалу в нашій країні потрібно здійснювати шляхом розширення вирощування садивного матеріалу у закритому ґрунті, із закритою кореневою системою та культурою in vitro. Під час створення та вирощування лісових культур останніми роками деякі лісогосподарські підприємства почали використовувати елементи сучасних технологій штучного створення лісових насаджень (застосування суперабсорбентів і вологонакопичувачів, регуляторів росту рослин, садивний матеріал із закритою кореневою системою та ін.), що сприяє підвищенню приживлюваності та росту культур. Проведений аналіз сучасних проблем лісокультурного виробництва у нашій країні свідчить, що незважаючи на обмежене фінансування, лісівники-практики та наукові працівники галузевих науково-дослідних установ і вищих навчальних закладів виконують значну роботу щодо підтримання на належному рівні цього напрямку практичного лісознавства. Повне чи часткове вирішення розглянутих вище проблем сприятиме інтенсифікації усіх складових частин лісокультурного виробництва, внаслідок чого буде забезпечено підвищення продуктивності та біологічної стійкості створюваних штучних лісових насаджень різного призначення, видів і типів в усіх лісорослинних зонах країни.

Ключові слова: лісокультурне виробництво; посівна якість насіння; лісонасінне районування; лісотипологічне обґрунтування заготівлі лісонасінної сировини; лісокультурне районування.

Н. М. Гузь

Национальный лесотехнический университет Украины, г. Львов, Украина

СОВРЕМЕННЫЕ ПРОБЛЕМЫ ЛЕСОКУЛЬТУРНОГО ПРОИЗВОДСТВА В УКРАИНЕ И ПУТИ ИХ РЕШЕНИЯ

Проанализировано современное состояние лесокультурного производства в Украине в разрезе его составляющих: лесное семеноводство, лесные питомники и лесокультурное дело. Установлено, что отечественное лесное семеноводство характеризируется недостаточным количеством и площадью объектов постоянной лесосеменной базы (в первую очередь клоновых и семенных плантаций, плюсовых и элитных деревьев). Поэтому на этих объектах заготавливается не более 10-12 % общего количества лесосеменного сырья. Заготовка лесосеменного сырья не всегда проводится из соблюдением требований лесной типологии и лесосеменного районирования. Современное лесосеменное районирование требует усовершенствования. Нормативно-законодательная база Украины в области лесного семеноводства нуждается в синхронизации с аналогичными документами стран ЕС. Интенсификация выращивания лесопосадочного материала в нашей стране должна происходить путем расширения выращивания в закрытом грунте, из закрытой корневой системой и культурой *in vitro*. При создании и выращивании лесных культур в последние годы отдельные лесохозяйственные предприятия начали использовать элементы современных технологий искусственного создания и выращивания лесных насаждений (применение суперабсорбентов и влагонакопителей, регуляторов роста растений, посадочный материал из закрытой корневой системой и т. п.), что способствует повышению приживаемости и росту культур.

Ключевые слова: лесокультурное производство; посевное качество семян; лесосеменное районирование; лесотипологическое обоснование заготовки лесосеменного сырья; лесокультурное районирование.