Tools for supporting forest business that ensure efficient forest management and restoration of forest resources in low-forest regions

S S Morkovina*, A V Ivanova and E Seydinay
Voronezh State University of Forestry and Technologies named after G.F. Morozov, 8 Timiryazeva St., Voronezh 394087, Russian Federation

*e-mail: tc-sveta@mail.ru

Abstract. The article is devoted to the improvement of the economic organization of the processes of reproduction of forest resources in the conditions of low-forest regions. It was established that the forestry of low-forest regions is subject to significant risks due to the presence of a number of natural and climatic specific features, which creates the need to develop areas for supporting the development of forest business that determine the effective operation of economic entities. A financial mechanism for supporting the forestry business of forest reproduction in low-forest regions has been developed, its architecture has been substantiated, calculations have been made to justify the amount of financial support allocated to forestry business for the reproduction of forests using seedlings of forest species grown with a closed root system. It is established that the proposed mechanism of financial support of forest business in the processes of forest reproduction will not only improve the efficiency of reforestation and preserve the ecological potential of forests, but also improve the conditions for the development of forest business in low-forest regions.

1. Introduction
The forest business is quite widespread in Russia, since the forests of the Russian Federation occupy about 70% of the land area and are the most important natural resource. In addition, available forest resources meet the multiple economic needs of entrepreneurs. It is well known that the most important factor in ensuring the effective development of forest business is the successful and without significant delay (in time and space) the renewal of forest resources in the cut down areas. The problem of implementation and development of entrepreneurial activities in the forestry sector is the most acute in a small forest zone where entrepreneurs are not sustainable and efficient, which is caused by a high degree of forestry risk combined with uncertainty and duration of income generation. Of particular interest in the current situation is the study of factors and determinants that determine the development of forest business [1].

Forests of low forest areas occupy 220 million hectares of total area and 29.8% of the forest-covered area of the Russian forest fund [2]. For a non-forest zone of Russia, to which the whole of its central part belongs, the most common form of doing business is renting forest plots for logging. In this case, the tenant is obliged to perform reforestation after the felling of the plantation is completed. In the literature, various ways of forest restoration are described:

1) to promote natural regeneration, which prevails in the taiga forests of North America and Europe, including the North of the European part of Russia;
2) artificial reforestation, which is used in countries to reduce low-productive forests, which are artificially replaced by more valuable tree plantations;

3) afforestation, oriented to the creation of forest plantations with a large set of useful properties, is used in countries with a sufficient number of forest lands;

4) the creation of forest plantations, which requires the application of a large complex of intensive forestry and forest melioration measures.

In the US, the bulk of timber logging is carried out in private domains and forests directly belonging to timber companies, where plantation forest cultivation is widely developed [3]. For Sweden is characterized by a stable increase in the area of forests, including through artificial reforestation. Forestry in Finland is also based on sustainable forest management [4]. Artificial afforestation is maintained at the state level. In the PRC state forests predominate. The new forest policy is aimed at preserving them through the creation of a plantation of fast-growing forest trees. Forest owners and forest rangers in Germany support natural processes in forest ecosystems. Reproduction of forests in Germany is stimulated for a long time by granting subsidies, the amount of which can reach up to 85% of the required costs. Adrian Whiteman (2015) notes that public spending on forestry has increased dramatically over the past decade [5].

Significant costs for planting forests are born in Asia, while Le et al. (2014) note a lack of research on the effectiveness of investment in reforestation [6].

At the same time, a feature of the considered foreign countries in the processes of forest restoration is the support of business structures that carry out this type of activity.

2. Materials and methods

The study is based on the use of a comparative-historical method, a normative approach to determining the costs of forest business for the implementation of forest reproduction processes. In the calculation of the cost of growing seedlings of forest species grown with a closed root system, a normative method of cost accounting and technological maps of the process of growing seedlings of forest species with a closed and open root system was applied.

In the technological maps, the composition of work, the rate of production, the tariff grades of work were determined and the need for mechanisms, materials and labor costs of workers was calculated.

In addition to the technological maps, other elements of the regulatory base were used to determine the costs of growing seedlings of forest species with a closed and open root system: single quotations for the production of works, standards for insurance premiums, standards for natural and objectively determined fall of plants by the age stages of growing crops.

When calculating the size of financial support for forest business in the processes of forest reproduction using seedlings of forest species grown with a closed root system, the formula was used:

\[ S = (C_{CRS} - C_{ORS}) \times n \]  

where \( S \) - amount of financial support;

\( n \) - the number of seedlings with a closed root system used for forestry forest management;

\( C_{CRS} \) - the total cost of seedlings of forest species grown with a closed root system (CRS);

\( C_{ORS} \) - the total cost of seedlings of forest species grown with an open root system (ORS).

3. Results

The low-forest areas of Russia have specific silvicultural-ecological and economic features that determine strategic guidelines in the management and development of forestry. First of all it is:

- a high level of development of transport infrastructure in combination with a low level of development of processing capacities;

- deficit of stands, oriented to industrial logging combined with high stocks of illiquid and small-scale timber;
the presence of significant stocks of re-wood in combination with the high ecological potential of available forest ecosystems;
- high population density combined with a significant demand for commercial timber and its processing and processing products;
- the significant role of small business in the implementation of forestry production in combination with low attractiveness of forest management and the underdevelopment of public-private partnership mechanisms;
- the predominance of artificial reforestation with high costs in combination with a low level of profitability of logging operations.

Understanding that forestry in low-forest regions differs significantly from forestry in forest regions, we come to the conclusion that specific methods and tools that take into account the features discussed above are needed to manage and develop it in non-forested regions.

Forests of the Voronezh Region (Russia) are typical for all non-forested regions, while the area of artificial reforestation for the period until 2020 will be about 3000 hectares, and the annual need for planting material is 10200 thousand pieces (Table 1). Climatic features of low-forest regions significantly complicate the processes of reforestation, and preference is given to growing seedlings with a closed root system, which provides for an increased survival rate and high quality of trees grown.

**Table 1.** The need for forest planting material for the creation of forest cultures in a low-forest region [7].

| Year of creation of forest cultures | Area of artificial reforestation, hectare | Necessary amount of planting material, thous pieces in the absence of an open root system | Total with closed root system |
|-----------------------------------|------------------------------------------|----------------------------------------------------------------------------------|------------------------------|
| 2018                              | 2891                                     | 9700                                                                              | 8300                         | 1400                        |
| 2019                              | 3023                                     | 10200                                                                             | 8700                         | 1500                        |
| 2020                              | 3024                                     | 10200                                                                             | 8700                         | 1500                        |

It is known that the main incentive for the acquisition of forest seedlings is the low price. Consider proposals for prices for planting stock of forest species, which act as an alternative to prices for seedlings with a closed root system (Table 2).

It has been established that the price for seedlings grown with a closed root system is significantly higher than the analogs - seedlings grown with an open root system, in oak for $0.07 USD in pine for $0.06 USD.

**Table 2.** Comparative characteristics of prices for planting stock of forest seedlings, $ USD.

| Indicators                                | Seedlings of oak stems | Pine seedlings |
|-------------------------------------------|------------------------|---------------|
| The cost of seedlings grown with an open root system | 0.08                   | 0.03          |
| Cost of seedlings grown with a closed root system | 0.15                   | 0.09          |
| Excess of prices                          | 0.07                   | 0.06          |

This creates a significant obstacle for the use of forestry seedlings with a closed root system during reforestation.

Therefore, it is necessary to improve the economic organization of the processes of reproduction of forest resources in the direction of using seeds with a closed root system in reforestation processes, using tools to support the forest business.

We carried out calculations to justify the amount of financial support allocated to forestry business for the reproduction of forests using seedlings of forest species grown with a closed root system (Table 3).
Table 3. Financial support of forestry business for the reproduction of forests using seedlings of forest species grown with a closed root system, counting on 1 unviolent region.

| Indicators                                    | Value      |
|-----------------------------------------------|------------|
|                                               | 2018 | 2019 | 2020 |
| Number of forest areas for reforestation, hectare | 420 | 445 | 445 |
| Number of seedlings                           |       |      |      |
| pine with CRS, thou pieces                    | 1710 | 2034 | 2367 |
| oak with ORS, thou pieces                     | 900  | 900  | 900  |
| The amount of financial support provided to the forestry business in the USD | 165 600 | 185 040 | 205 020 |
| oak with, $ USD                               | 102 600 | 122 040 | 142 020 |
| pine with, $ USD                              | 63 000 | 63 000 | 63 000 |
| The volume of financial support provided to the forestry business of the US $ per 1 hectare | 394.2 | 415.8 | 460.7 |

It is established that the amount of financial support for forest business per 1 hectare of areas subject to reforestation will be from 390.2 $ US to 460.7 $ USD. For a non-forested region, the amount of financial support allocated to reforestation processes using seedlings of forest species grown with a closed root system will be between $ 165,600 and $ 205,020 per year.

The need for financial support for forest business in the processes of forest reproduction using seedlings of forest species grown with a closed root system is due to a number of risks inherent in forestry in Russia.

The long terms of growing wood, the high level of dependence of tree growth on climatic conditions and anthropogenic influence, the availability of state ownership of forest plots makes entrepreneurial activity in the forest low attractive.

In these conditions, it is necessary to create a financial mechanism to support the forestry business of the reproduction of forests in low-forest regions.

The structure of this mechanism is shown in Figure 1.

The work of this mechanism of financial support of forest business is based on a number of principles:
- financial support is provided exclusively for the reproduction of forests in low-forest regions, the forests of which have important social and ecological significance;
- financial support is calculated based on the volume of reforestation, taking into account the pedigree composition of the seedlings;
- financial support is provided from the regional budget, directly to the forestry business, based on the results of the delivery - acceptance of the performed reforestation exclusively when using seedlings of forest species grown with a closed root system;
- financial support is provided to forestry costs incurred and documented.

The basis for providing financial support is:
- the lease agreement of forest plots and obligations for reforestation;
- the period of the activity of the forest business at the time of receiving financial support is at least 6 months;
- absence of debts from the forestry business for taxes, fees, penalties and fines;
- the certificate of completed works and other documents confirming the acquisition and planting of seedlings of forest species grown with a closed root system for the purpose of forest reproduction;
- results of acceptance of works on reforestation.
4. Conclusion
Forestry in low-forest regions is characterized by the presence of specific features and significant natural and climatic risks, which makes it less attractive for forest business. The effectiveness of reforestation processes in the forest fund of a small forest region is determined by the quality of forest planting material. The best results on reforestation have seedlings of forest species grown with a closed root system. It is determined that the price of seedlings of forest species grown with a closed root system is significantly higher than analogs - seedlings grown with an open root system. This circumstance predetermines the need for financial support for the forestry business carrying out reforestation using seedlings of forest species grown with a closed root.

The mechanism of financial support of forest business in the processes of forest reproduction using seedlings of forest species grown with a closed root system will be aimed at:
- Increasing the efficiency of reforestation, by using a qualitatively improved planting material with a closed root system;
- Improvement of conditions for the development of forest business in low-forest regions;
- Preservation of the ecological potential of forests, for the needs of future generations.

Figure 1. The mechanism of financial support of forest business.
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