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_____Kulik A.

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_____I. Kusiankou

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Abbreviations

AP	Aerial photography
EAEU	Eurasian Economic Union
FSBI	Federal State Budgetary Institution
GIL	State Forest Inventory
RUE	Republican Unitary Enterprise
SFE	State Forestry Enterprise
SPFE	State Production Forestry Enterprise
TCEP	Technical code of established practice
UAV	Unmanned aerial vehicle

Executive Summary

In the opinion of the Consultant, in order to ensure the integrity and continuity of the results, a single document has been prepared, its sections correspond to the terms of reference (Introduction to Report 1, 1.1 to Report 2, 1.2 to Report 3, 2.1 to Report 4, 2.2. to Report 5, 2.3 to Report 6, 3. to Report 7, 4. to Report 8, 5. to Report 9; 6. to Report 10.).

The analysis of the legislation of the Republic of Belarus regulating legal relations in the field of forest planning showed that, in general, the legislative base for the functioning of the forest planning in Belarus has been formed and allows to carry out forest planning operations at a high quality and at a high organizational level, but the existing regulatory framework does not provide the possibility of developing forest planning system, does not take into account the existing practice of forest planning. Some legislative requirements are not taken into account in production and require the introduction of appropriate amendments. Therefore, it is not necessary to speak about sufficient effectiveness of forest planning legislation.

A normative document is required in order to fully resolve the issue of the formation of lists of forest planning organizations that can carry out forest planning; the document must provide a mechanism for granting legal entities the right to conduct forest planning. Step-by-step regulation of the process of inclusion of the forest planning organizations into the list is required: what kind of ownership can the organization be, what statutory fund should it have, what staff of professional workers with what level of qualifications should the organization have, what taxation and office equipment should be available, the mechanism for filing an application for inclusion into the list, the time and procedure for its consideration, it is also advisable to provide objective reasons for which organizations can not be included into the list.

Also, in order to comply with the requirements of the new Forestry Code and the exclusion of forest planning from the list of activities for which the exclusive right of the state applies, amendments to the Law of the Republic of Belarus dated July 15, 2010 No. 169-3 "On sites that are only in the ownership of the state, and types of activities for the implementation of which the exclusive right of the state extends".

During the existence of the Republic of Belarus as an independent state, the planning of the forest fund in the republic was carried out in accordance with several technical documents: the forest planning instruction of the USSR (in the first years of independence), the forest planning instruction of the Republic of Belarus (the instruction on forest planning of the state forest fund, approved by the Forestry Committee under the Council of Ministers of the Republic of Belarus dated 23.09.2002 No. 12), the technical code of common practice (TCCP 377 - 2012 (2080), currently in force.

All these technical documents were based on the principles and experience accumulated during the planning of the forest fund of the Soviet Union, designed in the form of a forest planning instruction. In the future, when developing new technical documents, the necessary changes and additions were made to the instruction, which are more of a cosmetic nature. Normative documents did not set specific goals for the implementation of forest planning works, there were no time limits for their achievement, the documents themselves were unlimited. Therefore it is proposed:

1. In cases of the emerging need to implement production activities, to introduce changes to the regulatory legal and technical regulatory legal acts that determine the principles of forest planning of the forest fund of the Republic of Belarus in a timely manner.

2. Clearly define and formulate a list of goals and objectives to be resolved during the validity period of the technical code, that is, for one round of forest planning, the period during which the entire forest fund of the republic will be planned.

It seems viable to revise permissible technologies, methods of forest planning, standards for deviations in determining taxation characteristics, taking into account the development of forestry and the needs of the industry in the accuracy of the forest fund assessment, to eliminate initially unrealistic or formal requirements for forest planning or those that are formalized only for carrying out tasks .

An integral part of the process of improving legislation is the constant study and tracking of new inventory and forest planning technologies, the practice of applying digital methods for collecting and processing information in developed countries, and the introduction of these technologies into the process of forest planning in Belarus, securing of technologies that have proved themselves in practice in the legislation.

The survey (questionnaire) of the forestry enterprises, the RUE "Belgosles", the Ministry of Forestry, and other interested parties was conducted to identify problematic issues of the current system of forest planning and it showed that the opinions of the respondents regarding the market changes in the area of forest planning are divided approximately equally despite the slight advantage of the market supporters. This suggests that the forestry enterprises in the bulk are not ready for such issues, they do not have their own formed position on the effectiveness of forest planning. Due to the absence of any financial relations with the forest planning organizations (the forest planning is financed from the republican budget directly in Belgosles, and not at the expense of the forestry enterprise), the forestry enterprises do not face the issues of optimizing the costs of forest planning.

Some forestry enterprises do not see the expediency of any changes, or they do not fully understand the advantages and disadvantages of the market model, or they do not show any interest in reforming this sector.

However, the negative consequences of the existence of the current model are considered in the initial chapter of this study, which sets forth the prerequisites for conducting research and preparing proposals for improving the management model of forest planning.

At the same time, for the formation of a forest planning market, no matter private or state, decision-makers need to take into account not only its advantages, but also to anticipate and take into account all possible negative consequences of its formation, to use the experience of other countries that have already passed this way and the most useful material here will be the research material of the forestry enterprises in which they express their concerns on a number of issues:

- lack of professional knowledge among employees of private organizations;
- the possibility that so called "fly-by-night companies" will enter the market;
- responsibility for forest planning materials in case of liquidation of a private enterprise;
- support of the forest planning project throughout the whole period of its implementation by the forestry enterprise;
- control over conducting forest planning.

Preparation of a tabletop study of international experience in the field of organization and management of forest planning (on the example of selected countries leading in the sphere of forest planning, such as Finland, Sweden, Czech Republic, Russia, Poland); including analysis of the main achievements of the best international experience in forest planning (technologies, methods, techniques) showed that in almost all the countries under consideration a practically similar two-level organizational model of the forest planning is used:

- national forest inventory;
- forest design (classical forest planning).

In forest design, well-known methods of taxation (approximate, continuous counting, setting of relascope sites) are applied, depending on the required accuracy.

For all countries, as well as for Belarus, local application of elements of remote methods for characterizing forests is common, geoinformation systems are widely implemented and modern electronic equipment is used - GPS receivers, electronic altimeters and diameter measuring devices, recorders and digital maps with appropriate software. Based on the results of the forest design, forest planning designs are being developed in which the volumes of the main forest management activities and cutting are listed, which differ in different countries and regions, as a rule, by the target set of data, sheets, etc. necessary for the particular forest owner.

Multilevel organization of the system of forest planning with the national inventory can be considered more as a forced measure in countries with a large number of forest owners, including private ones. For example, in Sweden the number of forest owners is more than 200 thousand, in the Czech Republic - more than 280 thousand. According to the legislation of European countries, in

the absence of any planned economic activity, forest owners are not obliged to carry out forest planning, accordingly, there will be no information on forests in such cases. Thus, in order to obtain up-to-date, reliable information about the state of the country's forest fund, the efficiency of forest management, the provision of this information to the authorities and the formation of information resources, the governments of the countries resort to the statistical method of accounting for forest resources.

In Russia, the situation is different, due to the large area of forests and the lack of budget financing, forest planning with land-based elements of a taxation is not actually conducted on the entire forest fund area. Information on the area of the forest fund on which during the last revision period (10 years) forest planning was conducted with entering each allotment varies significantly in different sources. Reliable data can not be presented even by leading forestry experts of the Russian Federation. For example, on the official website of the Union of Foresters of St. Petersburg, the leading forestry scientist R.F. Treifeld in his article "Between the Forest Planning and GIL" indicates that the share of legitimate, non-overdue forest planning materials today does not exceed 10% of the total forest area of the intensive forest use zone (according to Roslesinfog it is 24%, but this data is together with cameral actualization, which is not a full-scale forest planing) (16). In addition, despite the state ownership of forests in Russia, and the *de jure* availability of forest resources to state-owned forestry enterprises, a large part of the forest has been leased to a multitude of private forest users. In the forest fund of Russia there are about 9,3 thousand administrative and economic units - objects of forest inventory (1,8 thousand forestries, former forestry enterprises, and 7,5 thousand zonal forestries). I.e. that the factor of plurality of forest owners actuates here too.

There are no so many forest owners in Belarus as in the countries under consideration, and forest planning is carried out according to the classical scheme throughout the entire forest fund every 10 years with entering each sub-compartment. Of course, from the date of approval of the forest planning project, the relevance of the data is reduced, but it can be concluded that no matter how representative the statistical sampling was, accounting of forest resources in the scale of the country, with entering each allotment is most accurate in Belarus. Currently, the question of assessing forest resources in Belarus is not urgent. Therefore, carrying out a national forest inventory in the country today will not give a proper positive economic effect.

Preparation of proposals for improving the quality of forest planning design, including the use of new technologies for collecting field data (sampling method and field measurement of areas); the use of various available data sources (such as satellite imagery, both from free access and commercial, digital aerial photographs, LIDAR, digital surface models, GIS systems and databases, etc.), and data storage and processing systems, software (comparing

open source software and proprietary software), and the dissemination of information through web portals. Of all the technologies widely spread in the developed countries under consideration, the most viable for Belarus will be forced introduction of technologies that will have a positive economic effect in the short term, including automatic decoding of photographs, expansion of the use of unmanned aerial vehicles, software updates similar to the examined software products Field-Map, ArcGIS.

Preparation of proposals for the improvement of technologies, methods, ways of forest planning design, application of modern measurement tools for forest taxation (taking into account the peculiarities of forest planning in the Republic of Belarus and economic efficiency). All the devices considered are high-precision, high-performance measuring instruments of the world's leading brands, which have been widely recognized and disseminated in the practical activities of developed European countries in forest planning and forest management. This equipment provides electronic collection, processing and storage of forest planning information on electronic media, it is the basis for creating cartographic materials. Undoubtedly today the cost of world-class equipment is quite high, but unlike the usual analogues of these devices (a tablet computer costing \$ 400, a caliper produced in Sweden costing about \$ 100, a Suunto PM-5/1520 altimeter produced in Sweden costing \$ 140, a Haglof chain-type (relascope) angle gauge produced in Sweden costing \$ 25, a Haglof Walktax thread distance measuring device produced in Sweden costing \$ 190) in countries where new forest planning technologies have already been developed and implemented in production, modern equipment pays in full and first of all due to automation of the production process.

Thus, the high cost of equipment reduces the costs of measuring operations, processing and verification of primary taxation data and, with the large-scale implementation of such tools, will require changes in the rationing of many types of work, which will require additional research. Undoubtedly, such expensive equipment can not be introduced into production at the same time (the cost price will increase several times), for example, providing 100 tax-collectors with tablets only, which constitute an annual demand for Belarus, will require a one-time payment of at least \$ 250000. The process of implementing new equipment should go step-by-step with the introduction of new technologies, training the personnel to work with new tools, smoothly redeploying those staff units to new directions, which will be gradually released by automation of processes.

Study of the positive and negative aspects of the functioning of the market for forest planing services (by the example of individual countries), including the preparation of a review of the positive and negative aspects of the functioning of the market for forest planing services (for the example of the above countries). The experience of the countries surveyed shows that the transition to a free market of forest planing must necessarily take place in the

intermediate stage of the market formation on which unambiguous state intervention is required. In order to prevent possible negative consequences, mayhem in the market the following should be clearly regulated at the level of legislative acts:

- requirements for organizations that will carry out forest planning (in terms of their technical and technological equipment, staffing);

- forest planning technologies and methods of taxation common for all market participants; unified approaches to organizing forest planning (the procedure for holding auctions, bidding, lots, etc.);

- the issue of the transfer of forest planning information and its integration in a single center;

- the issue of control over forest planning, acceptance, approval and introduction of forest planning materials;

- the issue of support of the developed forest planning project during the audit period.

After the stabilization of the market, it is possible, with a view to simplifying the business, to reduce state regulation to a certain extent. Enterprises that have positively proven themselves and have a certain development potential will retain their place in the market and will be so-called objects that regulate it using market-based tools and mechanisms, while the competitive environment will not allow small private traders, non-professionals with dubious capabilities, whose goal is one-time profit, to enter the market.

Development of proposals on the possibilities of forming a service sector in the field of forest planning design in the Republic of Belarus. The conditions of forestry management in Belarus in the market environment allow us to talk about the possibility and even the need to form the service sector in the field of forest planning design. The forest planning market will allow to conduct forest planning with the least expenditure, with the highest quality, using the new modern technologies and tools taking into account the economic efficiency.

The example of Ukraine, where forest planning is carried out by several state forest planning organizations, shows that in today's conditions the most economically justified model for Belarus will be the state forest planning market with four state forest planning organizations, and only after their adaptation to market conditions, to a competitive environment it is possible to talk about private organizations that will enter it. At the same time, the market should be regulated. With this approach, the organizational structure of the forest planning can be presented in the form of a centralized state structure, for example, a structural subdivision of the Ministry of Forestry with regulatory functions and state and non-state organizations. Such a structure will correspond to the model of a market economy, while simultaneously responding to the principle of state-private partnership. At the same time, legal regulation and control remains with the state represented by the central state body as a state administrative structure.

Control over compliance with the requirements of forest planning is viable for the Ministry of Forestry, customers with equal responsibility for compliance with laws, enforcements and regulatory framework of forest planning by all participants of the forest planning market, regardless of the form of ownership.

For the formation of forest planning services in the Republic it is recommended:

1. To approve a uniform methodology for all organizations for conducting forest planning (forest planning instructions).
2. To create a trading platform (electronic resource) for placing lots for basic forest planning.
3. To approve the mechanism for selecting organizations for forest planning (qualification requirements, cost of works, terms of work, other conditions).
4. To approve the methodology for calculating the starting price of lots (basic forest planning), using a differentiated approach (depending on the conditions of forest growth, types of forest, composition of plantations, complexity of work and other factors).
5. To approve the procedure for conducting electronic trading, a list of documents required for filing an application for participation in the auction.
6. To identify sources of funding for forest planning (budgetary funds, own funds of forestry enterprises, other sources).
7. To approve a unified methodology for assessing the quality of field and tabletop forest planning works (customer, Ministry of Forestry, country's control bodies).
8. To approve the minimum qualification requirements for organizations and specialists (taxating engineers).
9. To prepare amendments to the law (the decision of the Council of Ministers of the Republic of Belarus, which approved the procedure for conducting forest planning and the list of organizations conducting forest planning, Law of the Republic of Belarus dated July 15, 2010 No. 169-3 "On objects that are only in the ownership of the state, and the types of activities for which the exclusive right of the state extends " with a view to excluding forest planning from the list of activities for which the exclusive right of the state is distributed and the implementation of the exclusive right of the state to carry out certain activities).

Analysis of the possibility of creating a competitive environment for forest planning organizations in order to improve the quality of forest planning design and suggestion of the ways of its formation (taking into account the features of forest planning in the Republic of Belarus). In case of the creation of a market for forest planning services in Belarus, competitiveness in the market will depend on several key factors: the effectiveness of enterprise management (management professionalism), the quality of the work performed (professionalism of

the executors), the desired level of net profit, and the technology of work. The potential for increasing competitiveness lies in the optimal ratio of all these factors.

If we follow the model proposed in this study, obtaining competitive advantages for the cost of the work performed will reduce the state allocations for forest planning implementation by a factor of 2, **the annual savings will be about 1.5 million dollars.**

The two-times growth of wages of taxation engineers will raise the responsibility of specialists for the work performed and, accordingly, will improve the quality of forest inventory, the designation of economic activities. Competition will occur in the forest planning labor market. Reducing the costs of work will provide a competitive advantage in the external market. Implementation of the forest planning in Belarus, without changing the production norms, will require from 90 to 100 taxation engineers with a general management apparatus of 15-20 people (no more than 15-20% of the employees' staff), totally 105-120 people. Today, the staff of RUE "Belgosles" is more than 300 employees, therefore, it is recommended to target unengaged employees (more than 200 people) to foreign markets **that will be able to perform works on the export market of more than 2 million hectares, and that is another 2.6 million dollars of export proceeds.**

As a result of the reform performed, by means of savings (1.5 million dollars) and developing export markets (2.6 million dollars), it will be possible to receive at least from 2 to 3 million dollars annually of additional funds, which are recommended to be accumulated in the fund for the development of the forest planning and, at the control of the Ministry of Forestry, direct them for the development of new forest planning technologies, research and development, purchase of high-performance change tools, software development.

Action plan for transition to the market of services in the field of forest planning design. For the transition to the free market of forest planning, it is proposed to regulate the following issues at the level of legislation:

- requirements for organizations that will carry out forest planning (in terms of their technical and technological equipment, staffing);

- forest planning technologies and methods of taxation common for all market participants;

- unified approaches to organizing forest planning (the procedure for holding auctions, bidding, lots, etc.);

- the issue of the transfer of forest planning information and its integration in a single center;

- the issue of control over forest planning, acceptance, approval and introduction of forest planning materials;

- the issue of support during the revision period of the developed forest planning project.

Therefore, the transition to a market of services in the field of forest planning design is proposed to be carried out in several stages (Table 7):

Stage I 2017 - 2018 Formation of the regulatory framework;

Stage II 2019 Reorganization of RUE "Belgosles", a monopoly body in the field of forest planning, and creation of a national forest information center instead;

Stage III Modernization of forest planning technologies, software development.

Introduction

Features of the current system of forest planning of the Republic of Belarus are inherited from the Soviet model of forestry organization. Forest planning is based on budget financing, distributed by the Ministry of Forestry, the monopoly of the only state forest planning organization RUE "Belgosles", which has the right to conduct forest planning works.

This scheme, in the absence of pure competition in the market, significantly limits the possibility of developing forest planning without additional attraction of budgetary funds, restrains the export potential of forest planning services, attracting foreign exchange to the country.

A high level of costs for the maintenance of the management apparatus and support services of Belgosles increases the total cost of forest planning services in the country to 2-3 USD by 1 hectare, which significantly reduces the efficiency of the enterprise, the profit margin, the potential for modernization of the production process, material and technical base and software renewal, development and implementation of new modern forest planning technologies.

In developed European countries, the cost of forest planning works under market conditions is much higher and can range from 5 to 20 euros per 1 hectare of land, however, in this case it is necessary to take into account the technologies and methods of taxation, the accuracy of taxation measurements, the instruments and equipment used for this purpose, the development level of the country's economy. In comparable countries, for example, in Russia, where the market of forest planning services is formed by some private forest planning enterprises, the cost of 1 hectare of forest planning is reduced to a minimum value (less than 1 USD). It is not uncommon when lots for the implementation of the forest planning on the official trading grounds are approximately chosen by a contractor for 60-70 Russian rubles. In such cases, the cost of work reaches 50 rubles per hectare.

In such conditions of increased competition and at today's production costs, the consolidation of the Belarusian company Belgosles in the market of Russia and other markets has limited opportunities and does not contribute to the expansion of the export geographical spread. In contrast, those regions of Russia in which the Belarusian forest planning experience is traditionally the most in demand can in the near future abandon the services of the Belarusian enterprise.

The lack of competition in the field of forest planning in Belarus leads to the lack of incitements for improvement, motivation, development of the enterprise and, as a result, to a decrease in the quality of services provided, with a high cost of work, which directly affects the quality of forest planning.

Lack of competition in the market, low wages do not contribute to the personal and professional growth of the company's employees, the turnover of professional personnel increases, which also directly affects the quality of the work performed.

The above facts are prerequisites for studying the best practices in the organization of forest planning in the world, their analysis and the preparation of proposals of a recommendatory nature for possible application in Belarus.

The goal of the task was to prepare proposals for the Ministry of Forestry to improve the system of forest planning in the Republic of Belarus (based on international experience), proposal development for creating a competitive environment for forest planning design (including field data collection) in order to improve economic efficiency and quality of forest planning design.

To achieve this goal, the research work was carried out in 6 consecutive and interrelated stages:

1. The analysis and evaluation of the effectiveness of the current system of organization of forest planning in the Republic of Belarus (analysis of the forestry legislation of Belarus in the field of forest planning for the effectiveness of its use, a survey (questionnaire) of the forestry enterprises, RUE "Belgosles", Ministry of Forestry, other interested parties) were carried out to identify problematic issues of the current forest planning system with the presentation of relevant results and conclusions.

2. Proposals were developed to improve the system of organization of forest planning in the Republic of Belarus, to introduce new and improved forest planning technologies in Belarus, taking into account international best practices, to use modern measuring forest mensuration tools in forest planning. All proposals take the specific features of forest planning in the Republic of Belarus and the economic efficiency of their use into account.

For these purposes, a desk study of the country's international experience in the field of forest planning systems and organization (on the example of individual countries, which are leaders in the field of forest planning, such as Finland, Sweden, the Czech Republic, Russia, Poland) was conducted on the basis of Internet sources, the main achievements in the field of forest planning (technology, methods, techniques) were analyzed, conclusions are presented.

In addition, Internet data was used to analyze available world and field data collection technologies used in developed countries (sampling method and field measurement of areas); the use of various available data sources (satellite imagery, digital aerial photographs, LIDAR, digital surface models, GIS systems and databases, etc.), and data storage and processing systems, software.

3. Positive and negative aspects of the functioning of the market for forest planning services in those countries that most clearly characterize the special aspects of such a market, i.e., where

entry to the market does not have any legislative and regulatory barriers, where there are such barriers, but competition is allowed and where the right to conduct forest planning is given only to one state organization at the legislative level were analyzed. Based on the analysis, recommendations are proposed in this area for the conditions of Belarus.

4. Analysis of the legislative, economic and administrative possibilities for the formation of services in the field of forest planning design in Belarus was conducted, in particular an overview of the legislation of Belarus and the general law of the EAEU (Belarus, Russia, Kazakhstan, Armenia, Kyrgyzstan) was drawn up, possible scenarios of the economic effect (positive or negative) after the formation of the market, the administrative barriers to the formation of the market were given. Based on the presented materials, an opinion on the possibility or impossibility (with a negative economic effect) of the creation of a market for forest planning services in Belarus was prepared.

5. Analysis of the advantages and disadvantages of the competitive environment in the area of forest planning in Belarus was presented, and their impact on the quality of forest planning design and improvement of economic returns were assessed. Based on the analysis, recommendations on the possibility of creating competition, on the ways of its formation were prepared taking into account the features of forest planning in Belarus.

6. Draft action plan that reflects the possible optimal terms, methods and process of transition to a competitive efficient market for forest planning design services was proposed. Contractors for each stage of work were proposed.

The work was carried out during 2016-2017 by the director of LLC "LesProekt" with direct technical assistance of the enterprise employees, legal support of the enterprise lawyer and invited experts. The work involves open and publicly available scientific researches of authoritative scientists of Russia and Belarus in the field of forest planning, partners of the enterprise, analytical data of the financial statements of the enterprise and its partners in Russia.

The results of this work can be used by the Ministry of Forestry, Belgosles, and other agencies as a reference material for improving the system of the forest planning.

In the opinion of the consultant, in order to ensure the integrity and continuity of the results, a single document has been prepared, its sections correspond to the terms of reference (Introduction to Report 1, 1.1 to Report 2, 1.2 to Report 3, 2.1 to Report 4, 2.2. to Report 5, 2.3 to Report 6, 3. to Report 7, 4. to Report 8, 5. to Report 9); 6. to Report 10.).

1. Conducting analysis and evaluation of the effectiveness of the existing system of organization of forest planning in the Republic of Belarus, including collection of field data necessary for forest planning planning

Summary: This section provides a brief overview and assessment of the effectiveness of the application of the existing legislative framework for forest planning in Belarus. Summarized proposals of a recommendatory nature on the improvement of legislation, taking into account the development of forestry and the practice of conducting forest planning works, are given. The analysis of the research carried out in terms of the study of the opinion of the forestry enterprises, SPFE, Belgosles on the expediency of the formation of market relations in the field of forest planning services in Belarus, the development of a private forest planning model for the introduction of advanced international forest planning experience in Belarus with the presentation of relevant results, conclusions and recommendations.

1.1. Analysis of the legislation of the Republic of Belarus, which regulates legal relations in the field of forest planning

The realization of forest planning in the system of forestry legislation of the Republic of Belarus has a fundamental role. Conducting forestry and forest exploitation without forest planning are prohibited.

The legislation of the Republic of Belarus, which regulates legal relations in the field of the forest planning, is based on the provisions of Chapter 6 of the Forestry Code of the Republic of Belarus. In accordance with Article 24 of the Forestry Code, forest planning is a system of inventory and accounting of the forest fund, the design of measures aimed at ensuring rational, integrated use of the forest fund, improving the efficiency of conducting forestry, preserving the environment-forming, water protection, protective, sanitary, recreational and other functions of forests, effective reproduction, security and protection of forest and implementation of a single scientific and technical policy in forestry.

Thus, forest planning is the basis for ensuring the main principles and objectives of forest legislation in conducting forestry - ensuring rational and sustainable use of forests, their security, protection and reproduction, based on the principles of sustainable forest planning and conservation of biological diversity of forest ecosystems, conservation and strengthening of environment-forming, water-security, protective, sanitary, recreational and other functions of forests, increasing their resource potential, satisfying the needs of society in forest resources on the basis of scientifically based, multipurpose forest planning.

Article 35 of the Forestry Code identifies the main activities that are carried out during the forest planning (the definition of the boundaries of forest fund plots, the internal organization of forest fund territories, the inventory of the forest fund with the definition of forest fund land species, the species and age composition of forests, their condition, and the definition of qualitative and quantitative characteristics of forest resources, identification of forest fund plots that need cutting, forest planning measures, and ways of cutting; specification of areas used for restoration of forests and forest cultivation; determining the ways of reproduction of forests, determining the size of spurious forest use, harvesting secondary forest resources, using the forest fund for cultural and recreational, tourist, other recreational and (or) sports purposes; developing forest planning projects, author supervision over the implementation of forest planning projects).

According to the results of the carried out forest planning, a forest planning plan for each forestry enterprise according to which the forestry is conducted is compulsorily developed for a 10-year period. It is allowed to conduct preschedule forest planning, which is carried out in cases of massive damage or death of forests as a result of natural disasters or in other cases by the decision of the Ministry of Forestry. Forest planning plans in accordance with environmental legislation are subject to environmental review, which is conducted by the bodies of the Ministry of Natural Resources and Environmental Protection. Expertise gives a competent opinion on the conformity of the projected forest planning activities, types of forest planning to the requirements of environmental and forestry legislation and only after receiving a positive conclusion of the state environmental expertise forest planning plans can be reviewed at the Scientific and Technical Council of the Ministry of Forestry, approved and accepted for production.

Amendments to forest planning plans during their implementation are also taken by the decision of the Ministry of Forestry after obtaining a positive conclusion of the state environmental expertise. Thus, economic activities in the forest can be carried out only in certain areas and within the limits set at the level of the state administration body.

Until 2017, according to the requirements of Article 26 of the previous Forestry Code, the forest planning could only be carried out by the state forest planning organization of a specially authorized republican government body in the field of use, security, protection of the forest fund and reproduction of forests - the Ministry of Forestry (Republican Unitary Enterprise Belgosles with its territorial subsidiaries - Vitebsklesproekt and Gomellesproekt).

In the new edition of the Forestry Code of the Republic of Belarus, which became operative on January 1, 2017, this requirement was abolished. It means that legislators actually lifted the ban on forest planning by other business entities, except for the state forest planning organization. The government of the country is given the right to determine the list of organizations that can carry out forest planning in the country.

By the Decree of the Council of Ministers of the Republic of Belarus dated November 4, 2016 No. 907 “On measures to implement the Forestry Code of the Republic of Belarus,” the Government designated the Republican unitary enterprise Belgosles and its subsidiaries to be the organization to perform forest planning. Actually, the Decree approved an open list of forest planning enterprises, but no document ensures the procedure for including additional enterprises into it. The question arises what kind of enterprise, with what potential - personnel, technical, financial, etc. has the right and the opportunity to enter the list approved by the Government and carry out forest planning. For example, whether a private Belarusian forest planning enterprise with a staff of 15 people has the right to be included in the list. And with the volume of taxation works of 200 thousand hectares per year conducted? What should a private enterprise do to get on the list? What documents should be submitted to the Government for obtaining the right to conduct forest planning? These issues should be regulated by the Ministry of Forestry or the Council of Ministers in order to unify the requirements of the Forestry Code and the Government Decree.

With the adoption of the new Forestry Code, other legislative documents regulating the issues of forest planning have undergone changes. For example, since 2017, unified rules for the forest planning of the forest fund, established in the Procedure for Conducting Forest Planning of the Forest Fund, which was approved by the Decree of the Council of Ministers of the Republic of Belarus dated 12 July 2001 No. 1030, have been discontinued.

Instead of this document, the Decree of the Council of Ministers of the Republic of Belarus dated November 4, 2016 No. 907 On measures to implement the Forestry Code of the Republic of Belarus establishes a new Statement on establishing the procedure for forest planning, the development and approval of a forest planning design, amendments and/or additions thereto. The document establishes the objective of forest planning (assessment of the state and use of forest resources, development of forest planning plans that ensure long-term, multi-purpose and rational (sustainable) use of forest resources and their reproduction, the formation of a database of information systems on the forest fund, obtaining other information on the forest fund), the objects of forest planning (the forest fund plots provided to the forestry enterprises for forest planning).

The Decree distinguish the rights and responsibilities of the forestry enterprises and the forest planning organization arising in the course of the complex of works, establishes the composition and content of preparatory, field and cameral forest planning works, as well as their elements. The government granted the right to the Ministry of Forestry to establish technical requirements for forest planning, the content of forest planning operations, the procedure for their organization, the composition of forest planning documentation.

All the technological features of forest planning, the composition of forest planning documentation, a set of other technical requirements for forest planning in accordance with the

legislation are approved by the Decree of the Ministry of Forestry dated April 11, 2012 No. 5 “On the approval of the technical code of the established practice No. 377-2012 (02080) Rules for Forest Inventory Management”.

The rules for carrying out forest planning of the forest fund are established through:

1. General requirements for the conduct and maintenance of forest planning (the composition of forest planning activities, the technical basis for forest planning);

2. Methods and organizational and technical indicators of forest planning. Forest planning is carried out using the technologies of basic (periodically repeated) and continuous forest planning. When carrying out the regular basic forest planning, the continuity of the materials of the previous forest planning should be maintained, the numbering and boundaries of the forest quarters, taxation sub-compartments, the main tree species, the type of forest should be preserved (if no substantiated changes are required).

Changes in the boundaries of taxation sub-compartments are allowed in cases when part of the plantation in the old boundaries of the taxation sub-compartments has been cut down or destroyed (as a result of cutting or other reasons), resulting in two taxation sub-compartments and errors in establishing the boundaries of taxation sub-compartments in the previous forest planning.

The main method of forest planning is the age class method. The primary accounting unit of the forest fund in forest planning according to the age class method is the taxation sub-compartments, and the primary unit of account is the prevailing species. In forests with a high intensity of conducting forestry, a local method of forest planning can be applied with organization of permanent economic units as primary economic accounting units;

3. Interrelations of the state forest planning organization with customers of forest planning services and local executive and administrative bodies (rights and responsibilities of the forest planning organization and customers, local authorities);

4. Technical and forest planning meetings requirements (for the purpose of organization of forest planning services, discussion of the specifics of their implementation, coordination of the scope of the planned forest planning activities, technical and forest planning meetings on which organisational decisions and decisions on the changes to the design are made prior to the approval of the forest planning project according to the size of the calculated wood cutting area in accordance with harvest cutting, ways of cutting and volumes of forest planning activities (cleaning cutting, creation of forest cultures, reconstruction of plantations);

5. Requirements for carrying out preparatory work for forest planning (conducted with a view to solving organizational and technical issues and implementing specific measures necessary for better organization and quality of field forest planning, a technical basis for forest planning is also being prepared - aerospace survey materials used in forest planning operations);

6. Requirements for conducting field (forest inventory) forest planning activities

(establishment of boundaries of the forest planning facility, preparation of aerospace images for taxation, collective training, detachment of taxation allocations, determination of taxation indicators, design of forest planning activities, types of forest exploitation);

7. Requirements for carrying out table-top (design) activities

(processing of primary taxation data, compilation of forest planning design and cartographic materials, designing forest categories, analyzing the dynamics of forest fund indicators, analyzing the results of economic activity for the previous revision period, designing cutting, drawing up the corresponding cutting lists, designing reforestation activities, forest cultivation, reconstruction of forest plantations and development of forest seed and forest nurseries, security and protection of forests, conservation of biological diversity, ecological basis of projected forest planning activities);

8. Peculiarities of carrying out forest planning operations depending on the purpose of the forest

(features of forestry activity, restrictions on forest use in the territory of reserves, national parks and experimental forest-hunting farms, wildlife sanctuaries, forests used for recreational purposes in water protection zones and coastal forest areas, and in the forests located in zones of radioactive contamination);

9. Other technical elements of forest planning.

The system of normative and legal base of forest planning is supplemented by the technical code of the established practice No. 350, which regulates the issues of the author's supervision of the implementation of forest planning plans into production. The document establishes the timing and technical features of the supervision of the implementation of projected volumes of forest planning activities, types of forest planning, as well as forms of accounting data and analytical information that is prepared following the results of the author's supervision.

Conclusions and recommendations: generally, the legislative base for the functioning of the forest planning system in Belarus has been formed and allows to carry out forest planning operations at a high quality and at a high organizational level, however, the existing regulatory framework does not provide the possibility of developing a forest inventory and does not take into account the existing practice of forest planning. Some legislative requirements are not taken into account in production and require the introduction of appropriate amendments. Therefore, it is not necessary to speak about sufficient effectiveness of forest planning legislation.

In order to fully resolve the issue of the formation of lists of forest planning organizations that can carry out forest planning, a normative document is required in which it is necessary to provide a mechanism for granting legal entities the right to conduct forest planning. Step-by-step regulation of the process of inclusion of the forest planning organizations in the list is required: what kind of ownership can the organization be, what statutory fund should it have, what staff of

professional workers with what level of qualifications should the organization have, what taxation and table-top equipment should be available, the mechanism for filing an application for inclusion into the list, the time and procedure for its consideration. It is also advisable to provide objective reasons for which organizations can not be included in the list.

Also, in order to comply with the requirements of the new Forestry Code and the exclusion of forest planning from the list of activities for which the exclusive right of the state applies, amendments to the Law of the Republic of Belarus dated July 15, 2010 No.169-3 "On sites that are only in the ownership of the state, and the types of activities for which the exclusive right of the state extends" should be made.

During the existence of the Republic of Belarus as an independent state, the organization of the forest fund in the republic was carried out in accordance with several technical documents: the forest planning instruction of the USSR (in the first years of independence), the forest planning instruction of the Republic of Belarus (the instruction on forest planning of the state forest fund, approved by the Forestry Committee under the Council of Ministers of the Republic of Belarus dated 23.09.202 No. 12), the technical code of the established practice (TCEP 377 - 2012 (2080), currently in force.

All these technical documents were based on the principles and experience accumulated in the construction of the forest fund of the Soviet Union, designed in the form of a forest planning instruction. In the future, when developing new technical documents, the necessary changes and additions were made to the instruction, which are more of a cosmetic nature. Normative documents did not set specific goals for the implementation of forest planning activities, there were no time limits for their achievement, and the documents themselves were unlimited. Therefore it is suggested:

1. In cases of the emerging need to implement production activities, to introduce changes into the statutory and regulatory and technical regulatory legal acts that determine the principles of forest planning of the forest fund of the Republic of Belarus timely.

2. Clearly define and formulate a list of goals and objectives to be resolved during the validity period of the technical code that is for one round of forest planning, the period during which the entire forest fund of the republic will be managed.

It seems advisable to revise permissible technologies, methods of forest planning, and standards of deviations in determining taxation characteristics, taking into account the development of forestry and the needs of the industry in the accuracy of the forest fund assessment, to eliminate initially unrealistic or formal requirements for forest planning or those that are formalized only for carrying out activities.

Attention should be paid, for example, to the effectiveness of collective training and survey work **(to exclude formalism or to abolish in all, to oblige the taxator in the first month of the field to tax selectively and using all the volumes of the reforestation, forest plantations, non-timber forest resources)**, technical and forest planning meetings **(all issues discussed there should be prescribed in the regulatory framework with unambiguous understanding)**, training of young taxators **(only the eye-measuring method with the head of the party, the change in the monthly rate, the extra charge to the latter)**, the continuity of materials from the previous round of the forest planning. Increase the accuracy of taxation by expanding the use of the sampling-measuring, enumeration methods **(an unacceptable height error is greater than +/- 1 meter instead of +/- 7%, an unreliable determination of the plantation's completeness)**. In normative documents, it is necessary to prescribe what is really done or should be done in the course of forest planning.

For example, in TCEP 377-2012 (02080) it is stipulated that during the next basic forest planning, the continuity of the materials of the previous forest planning should be maintained, the numbering and boundaries of forest quarters, taxation allocations, main tree species, types of forest should be preserved (if not specially justified). Changes in the boundaries of taxation allocations are allowed in cases where part of the plantation in the old boundaries of the taxation allocation has been cut down or destroyed (as a result of cutting or other reasons), resulting in two taxation sub-compartments and if there were errors in establishing the boundaries of taxation allocations during previous forest planning. At the same time, the experience of conducting field forest taxation works and the development of cartography shows that in fact the continuity of the materials of the previous round of forest planning in the republic is absent. This is due to a number of reasons, among which the main one is the low quality of carrying out field taxation work in the previous round of forest planning. Significant impact on the quality of forest planning and especially on the establishment of the boundaries of taxation allocations was provided by low-quality aerial photographs. As a rule, it is necessary to use spectrozonal images of scale 1:10000 for high-quality interpretation of images in the forest planning. However, the last two rounds of forest planning in Belarus were carried out using color imagery at a scale of 1:15000. The quality of these materials did not meet the minimum acceptable quality criteria of the Belarusian forest planning.

Another important problem of continuity of materials of the previous round of forest planning is intensive economic activity. As a result of occurring natural phenomena, shrinking of plantations and, as a result of forest planning activities in isolated forest areas, as well as the allocation of certain categories of forests and specially protected areas, fragmentation of species takes place, taking into account the criteria for their isolation. It is not uncommon, when there are at least 50 taxation sub-compartments in the quarter, at the same time it is not possible to merge

similar sub-compartments into one based on the normalized criteria for organization of the territory. This greatly complicates the process of forest planning, increases the cost of conducting economic activities in the forest, reduces profitability and economic efficiency of management. Therefore, the most important element of the strategic planning of the forest fund area, the continuity of materials of the previous round of forest planning, approaching to the conduction of forest planning in economic areas (the local method of forest planning) is a fixed boundary of the taxation sub-compartment and its modification can be allowed only in the following cases:

1. change of boundaries and the area of taxation sub-compartments in the following cases:

seizure of state forest fund lands;

reorganization of the forestry quarter;

cutting or death of a part of the plantation in the old boundaries of the allotment, as a result of which two or more allocations are formed;

identification of errors in establishing boundaries of sub-compartments during the previous forest planning;

the area of the sub-compartment is 3-5 hectares (a small quarterly network), 4-10 hectares (usual), besides the exceptions - forest cultures, cuttings, etc.,

2. change of boundaries and area of the quarter is allowed in the following cases:

seizure of state forest fund lands;

admission of the territories adjacent to the quarter to the state forest fund;

reorganization of the quarter.

establish that if the boundaries of the quarters are changed, their sizes may deviate not more than ± 50 percent (to exclude unlimited adherence of lands accepted to the state fund).

3. the numbering change of the quarter and the sub-compartment is allowed in the following cases:

acceptance of additional areas into the composition of the state fund;

reorganization of the quarter;

the formation of new sub-compartments in cases when this is permissible (see above).

4. change of the main tree species or forest type is allowed in the following cases:

identification of errors in the previous forest planning;

cutting of the plantation;

transition of plantations from one enterprise to another in consequence of economic activity;

the formation of new taxation sub-compartments in cases when it is permissible.

An integral part of the process of improving legislation is the constant study and tracking of new inventory and forest planning technologies, the practice of applying digital methods for

collecting and processing information in developed countries, and the introduction of these technologies into the process of forest planning in Belarus, securing technologies that have proved themselves in practice in the legislation.

1.2. A survey (questionnaire) of the forestry enterprises, RUE "Belgosles", the Ministry of Forestry, as well as other interested parties in order to identify problematic issues of the current forest planning system.

In order to identify problematic issues of the current forest planning system, to determine the ways of development of forest planning in the medium term, the possibility of introducing market mechanisms in the sphere of forest planning it was suggested by the executor and supported by the Ministry of Forestry to conduct a questionnaire survey among active workers in the industry representing sample representativeness. For these purposes, a survey (questionnaire) was prepared and coordinated with the Ministry of Forestry to conduct a survey (polling, questionnaire) of the leading employees of the Ministry of Forestry, forestry enterprises, state production forestry associations, RUE "Belgosles" and other interested parties. The questionnaire includes both general and specific creative questions for a competent response, which require a thorough knowledge of forestry production and practical experience:

1. Specify the list of normative documents (legal and technical), in accordance with which the regulation of forest planning in the Republic of Belarus is carried out.
2. List the documents in the field of forest administration, forest planning, which need to be improved taking into account the development of forestry, forest management, forest inventory operations, modernization of forestry production technologies and techniques, practice of their application, optimization of technological and management processes in the forestry sector.
3. Describe, with specific examples, the problematic issues of applying in practice the existing documents on the regulation of forest planning.
4. Give specific wording that you consider necessary to be added to legal and technical documents regulating forest planning relations or to exclude them. Explain the answer.
5. Identify any problematic issues that you see in the current system of organization of forest planning.
6. Is the interaction of your forestry establishment with the forest planning organization sufficiently organized? If not, in which areas is the interaction organized insufficiently?
7. Describe how you see forest planning in the future.
8. In your opinion, is the market of forest planning services necessary in the Republic of Belarus, if so, how many organizations in this market should work and what type of property should they be? Explain the answer.

9. In your opinion, is it possible to carry out forest planning in the republic by private forest planning organizations?

10. If you are a supporter of the formation of a market for forest planning services in Belarus, then in what period is it expedient to form it - immediately or gradually, for how many years?

11. In your opinion, what method of forest planning (age classes or zonal level) is most suitable for the conditions of Belarus and whether there is an expediency, including economic changes in the method of forest planning at the present stage of forestry development. Explain the answer.

12. How do you think it is necessary to improve the quality of forest inventory in the Republic of Belarus (it means obtaining more accurate forest taxation characteristics of the forest fund, rather than assigning forestry activities). Explain the answer.

13. Which of the following methods of taxation (approximate, selective-measuring, enumerative) should be applied in the conditions of Belarus?

14. Which countries' experience in the field of forest planning is most suitable for the conditions of Belarus? Explain the answer.

15. Describe what specific examples of forest planning and forest inventory you would propose to implement in our country.

During the study more than 100 respondents from almost all forestry enterprises and SPFE, Belgosles took part. Therefore, there is no doubt that the sample is representative. Analysis of the data provided by the forestry enterprises shows that, in general, the work on forest planning in the republic has been organized quite effectively. According to the questionnaires, the interaction of the forestry enterprises with the forest planning organization is organized at a high enough level, as evidenced by the fact that according to Table 1, almost 100% of the respondents favored the absence of any problem points in this direction.

Table. 1. Is the interaction of your forestry establishment with the forest planning organization sufficiently organized?

SPFE	Yes, %	No, %	No answer, %
Brest SPFE	100		
Vitebsk SPFE	95		5
Gomel SPFE	95	5	
Grodno SPFE	90	10	

SPFE	Yes, %	No, %	No answer, %
Minsk SPFE	94		6
Mogilev SPFE	92	8	
RUE Belgosles			

At the same time, the opinions of the forestry enterprises were divided on the question of the expediency of the formation of a market for forest planning services in Belarus. According to Table 2 of the 100 respondents, 48 or 48% supported the development of the forest inventory market, 41 respondents, or 41% opposed, 11 respondents were undecided (11%). If the analysis is carried out in the context of the regional state production forestry enterprises, so the situation is as follows: Brest SPFE 8 - for, 6 - against, Vitebsk SPFE 6 - for, 11 - against, Gomel SPFE 14 - for, 4 - against, Grodno SPFE 6 - for, 5 - against, Minsk SPFE 6 - for, 8 - against, Mogilev SPFE 7 - for, 6 - against.

The data presented show that there is no clear understanding of how the system of organizing and conducting forest planning should develop in the forestry enterprises.

Nevertheless, the main arguments of the forestry enterprises supporting the forest planning market are:

- 1. Competition;**
- 2. Improvement of forest planning design quality;**
- 3. Reduction of the cost of forest planning activities;**
- 4. Stimulating the development of new technologies.**

Forestry enterprises that are against market mechanisms as arguments usually claim that there is state ownership of forests in the country and, accordingly, forest planning should be state. A number of forestry enterprises express concern over the lack of control over the performance of activities by private entities or responsibility for forest planning materials in case of liquidation of private companies, there is a fear of "fly-by-night companies", lack of sufficient knowledge among private organizations (Ivatsevichy, Lyakhovichy, Orsha forestry enterprises). Some forestry enterprises (Baranovichy, Gantsevichy) support the possibility of the existence of a private forest planning and at the same time deny the possibility of forming a market for forest planning services as such. The position of those forestry enterprises that do not support private forest planning, but they consider it expedient to form a market for forest planning services involving state forestry enterprises is also interesting.

RUE "Belgosles" expresses the position that **"In itself, the market of forest planning services is possible and can be useful** if the main criterion for selecting organizations for forest planning is primarily not the price of activities, services (as we do in the vast majority of cases), but the confirmed quality of work".

Currently, the decentralization of the market for forest planning services is possible through the reorganization of RUE "Belgosles", giving the status of independent legal entities to the existing

four forest planning expeditions and subsidiaries, changing the functions and status of the central apparatus. In any case, centralization of conducting forest planning (or coordination) should be preserved. "

Table. 2. In your opinion, is the market of forest planning services necessary in the Republic of Belarus and how many organizations in this market should work and what type of property should they be?

SPFE	Yes, %	No, %	No answer, %
Brest SPFE	57%	42	
Vitebsk SPFE	32	58	10
Gomel SPFE	67	19	14
Grodno SPFE	55	45	
Minsk SPFE	33	44	33
Mogilev SPFE	53	38	9
RUE Belgosles		100	

The ambiguous position of the forestry enterprises is also expressed about the possibility to carry out forest planning by private forest planning organizations in the republic.

Table 3 shows that out of 100 respondents, 49 or 49% supported the development of the forest inventory market, 39 respondents or 39% opposed it, 12 respondents (12%) were undecided. In the context of the regional state production forestry unions, the situation is as follows: Brest SPFE 9 - for, 5 - against, Vitebsk SPFE 9 - for, 9 - against, Gomel SPFE 13 - for, 4 - against, Grodno SPFE 6 - for, 5 - against, Minsk SPFE 3 - for, 9 - against, Mogilev SPFE 8 - for, 6 - against.

The main arguments in favor of private forest planning, as well as the service market, are the competitive environment (the most efficient one) - the reduction in the cost of the work performed (the costs of production for private traders and, at the expense of competition, is lower than those of state-owned enterprises, especially monopoly organizations) as a result - improving the quality of work performed due to the struggle for the market.

The forestry enterprises that oppose private forest planning are more concerned about the fact that forest planning materials are developed for a long time, usually up to 10 years, require maintenance, updating, supervision, and, therefore, the customer does not have guarantees that the private forest planning company that completed the work today will exist during this time period for 5-10 years.

RUE "Belgosles" expressed a position that "forest planning is in fact a part of the system of state forest administration - one of the most important components of state property. Therefore, forest planning should be carried out by the state organization, taking into account that maintenance

of the forest planning plan, including author's supervision, and the possibility of making changes and additions for 10 years should be provided. There are no guarantees that private organizations will exist for such a period. A unified system for the formation, processing and storage of forest planning databases should also be provided.

The example of the Russian Federation shows that the thoughtless referring of forest planning to the sphere of public services actually led to a loss of control over the condition and exploitation of the state's forest resources. At the same time, the existence of so-called competition only aggravated this situation. The experience of the Russian Federation does not allow us to recommend such a perspective. The private forest planning system was not widely used even in Western and Eastern Europe. Therefore, we believe that forest planning activities should be handled by highly specialized enterprises controlled by the state."

From the above, it can be concluded that some forestry enterprises and RUE Belgosles are concerned with the possibility of accompanying the forest planning project developed by the private company during the entire period of its implementation by the forestry enterprise.

Warranty maintenance of forest planning materials can be carried out at the expense of the stabilization fund, which is formed by own funds of the forest planning companies, regardless of the form of ownership, before signing a state contract for the performance of forest planning activities in the amount of 20% of the total value of the contract. If within five years after the forest planning implementation the changes and additions related to the poor performance of forest planning operations have not been made to the forest planning materials, the amount paid to the stabilization fund by the forest planning company is returned to it in full, or reserved for other objects. If any warranty works were made, then the amount is returned, minus the cost of guarantee work. It should be noted that the forestry enterprise itself has the right to choose a forest planning company that will provide warranty services for forest planning materials. This norm is already being studied with a view to introducing it into the regulatory framework.

Table. 3. In your opinion, is it possible to carry out forest planning in the republic by private forest planning organizations?

SPFE	Yes, %	No, %	No answer, %
Brest SPFE	65%	35	
Vitebsk SPFE	47	47	6
Gomel SPFE	62	19	19
Grodno SPFE	55	45	
Minsk SPFE	17	50	33
Mogilev SPFE	32	38	
RUE Belgosles		100	

The opinions of the respondents on the timing of the transition to market mechanisms for the functioning of the forest planning were also divided.

Table 4 shows that out of 100 respondents, 50 or 50% spoke in favor of immediately moving to the forest planning market, 24 respondents or 24% opposed, 26 respondents (26%) were undecided. In the context of the regional state production forestry unions, the situation is as follows: Brest SPFE 9 - immediately, 5 - gradually, Vitebsk SPFE 13 - immediately, 1 - gradually, Gomel SPFE 13 - immediately, 3 - gradually, Grodno SPFE 6 - immediately, 1 - gradually, Minsk SPFE 3 - immediately, 10 - gradually, Mogilev SPFE 5 - immediately, 3 - gradually.

The main reason for the gradual transition to a market mechanism for forest planning of forestry enterprises is the need to form a regulatory and legal framework. RUE "Belgosles" in the questionnaire indicated that the market of forest planning services in terms of forest planning of the forest fund is inappropriate. **It is possible to form a market for other services close to the profile of forest planning, for example, by transferring off-bearings and taxation of the cutting fund to the sphere of services.**

Table. 4. If you are a supporter of the formation of a market for forest planning services in Belarus, at what time should it be expedient to form it - immediately or gradually?

SPFE	Yes, %	No, %	No answer, %
Brest SPFE	65%	35	
Vitebsk SPFE	68	5	27
Gomel SPFE	62	14	24
Grodno SPFE	54	10	36
Minsk SPFE	17	55	28
Mogilev SPFE	39	15	46
RUE Belgosles		100	

To the question - what countries experience in the field of forest planning is the most suitable for the conditions of Belarus, the majority of respondents spoke in favor of introducing the experience of Poland in the Republic of Belarus (46%), for the experience of Finland 28% of the respondents surveyed, 12% supported the experience of the reforms of the Russian Federation. 14% of respondents believe that Belarus needs to develop its own model of forest planning and forest planning.

Conclusions and recommendations: the results of the conducted survey show that the respondents' opinions on market changes in the area of forest planning are divided roughly equally despite a slight advantage of the market supporters. This suggests that the forestry enterprises usually are not ready for such issues, they do not have their own formed position on the effectiveness of forest planning. Due to the absence of any financial relations with the forest planning organizations (the forest planning is financed from the republican budget directly to

Belgosles, and not at the expense of the forestry enterprise), the forestry enterprises do not face the issues of optimizing the costs of forest planning.

Some forestry enterprises do not see the expediency of any changes, or they do not fully understand the advantages and disadvantages of the market model, or they do not show any interest in reforming this sector.

However, the negative consequences of the existence of the current model are considered in the initial chapter of this study, which sets forth the prerequisites for conducting research and preparing proposals for improving the forest planning model.

The forest planning market itself is effective, evidence of this with supporting facts will be given in the following chapters of this work, even the opinion of the interested state forest planning organization of the monopoly Belgosles supports it – **In itself, the market of forest planning services is possible and can be useful if the main criterion for selecting organizations for forest planning is primarily not the price of activities, services (as we do in the vast majority of cases), but the confirmed quality of work.**

At the same time, to form a forest planning market, no matter whether it is private or state, decision makers need to take into account not only its advantages, but also to anticipate and take into account all possible negative consequences of its formation, to use the experience of other countries that have already passed this way and here the most useful is the research material of the forestry enterprises in which they express their concerns on a number of issues:

- lack of professional knowledge among employees of private organizations;
- the possibility of entering of so-called "fly-by-night companies" to the market ;
- responsibility for forest planning materials in case of liquidation of a private enterprise;
- support of the forest planning project throughout the whole period of its implementation by the forestry enterprise;
- control of forest planning.

2. Development of proposals for improving the system of organization of forest planning in the Republic of Belarus and introduction of new technologies, taking into account international best practices

Summary: This section provides an overview of the best forest planning practices and applied technologies for assessing forest resources in countries such as Finland, Sweden, the Czech Republic, Russia, Poland, taking into account national circumstances. The objective reasons of carrying out the forest planning by the given countries on the two-level organizational model (national inventory, classical forest planning) are analyzed. Examples of the most common technologies and measuring instruments for the purpose of forest planning (LIDAR aerial laser scanning of the surface, unmanned aerial vehicles, automatic photo interpretation, ArcGIS, Field-Map software packages, technologies of national forest inventory, etc.) are considered; these, depending on the required forest planning information and its accuracy can be applied in the conditions of Belarus in a varying degree.

Recommendations for the conditions of the Republic of Belarus on organization and implementation of forest management according to the model of classical forest planning and conducting research in local sites for national forest inventory have been proposed in order to compare the data of wood stocks conducted by various methods, and methods of zonal forest planning, unmanned aerial vehicles technologies, automatic decoding of photos, introduction of new modern software products upon analog of Field-Map, use of new modern high-precision measuring instruments in forest taxation.

2.1. Preparation of a desk study of international experience in the field of forest planning systems and organization (on the example of selected countries, which are leaders in forest planning, such as Finland, Sweden, the Czech Republic, Russia, Poland); including analysis of the main achievements of international best practices in forest planning (technologies, methods, techniques)

In order to study the best practices for organizing and conducting forest planning in developed European countries, and to avoid possible negative consequences in the reform of the forest planning sector, that the countries faced, it is suggested to consider the experience of countries such as Finland, Sweden, Czech Republic, Russia, Poland, which can be applied in conditions of the Republic of Belarus.

It should be noted that the choice of the countries (Finland, Czech Republic, and Sweden) is defined by the technical assignment for the work due to the fact that the Government recommended

to the Ministry of Forestry to introduce the best forestry practices of the Scandinavian countries in Belarus. The contractor of the works in coordination with the Ministry of Forestry proposed to consider additionally models of forest planning of neighboring countries the most interesting and similar for Belarus - Russia and Poland, especially since in the early 1990s, Belarus, Russia and Poland had practically comparable starting positions of development and a similar arrangement of forestry. The experience of Poland is also useful because the results of reforms of the forest sector of this country, conducted since the end of the last century, are highly appreciated by independent international experts. Russian experience is suggested to be considered as one of the most controversial. On the one hand, much has been done in the country for the development of the forestry complex, its transfer to the market type of doing business without transferring forests to private ownership, and on the other hand, because of the insufficiency of budget financing, low-income forestry subsectors (segments), for example, forest planning, are affected. It is worth noting that in the process of forming the Eurasian Economic Union, the legislation of Russia and Belarus, including the forestry sector, will tend to gradually converge, harmonize and unify in order to create common business conditions within the borders of the union.

Finland:

The Finnish forest planning system is a two-level system:

the first level is the national forest inventory;

the second level is the actual forest planning or forest planning of forest management activities on separate territorial units or within the boundaries of land ownership.

The task of the national forest inventory is to obtain information about forests on a national scale, the task of forest planning is to support the forest owners in making decisions that manage the productive capacity of forest areas in order to extract the maximum benefit by the forest owner.

Inventory of forest resources:

is carried out by the Forest Research Institute (Metla);

is based on a systematic sampling of experimental sites;

is used to compile calculations for large areas, regions of forest centers;

is carried out by many sources (satellite imagery and other digital materials), calculations at the level of the administrative district;

result for forest exploitation - calculations on logging/estimated cutting areas.

With the help of forest planning activities, forestry programs are implemented in practice, based on scientific research and practical experience, forest owners receive advice for activities that contribute to the realization of their own goals:

- reforestation;
- care for young forests and thinning;
- harvest cutting;
- forest hydromelioration/repair of drainage system;
- construction and proper maintenance of forest roads;
- fertilizing;
- the efficiency of wood procurement and logging, the involvement of logging contractors;
- different objects of application of geographic data.

Regional forest planning plans and forest planning plans for individual forestry enterprises are compiled by forest centers and include the following information:

- the owner, the enterprise, the forest planning plan and its originator;
- the current state of the forest and the tasks of forestry;
- forecasts for the development of forests for the planning period (in case of performing the recommended works);
- key moments of forestry development in this sector;
- places of growth on the hills and bogs;
- types of wood and development classes;
- data on the growing stock according to development classes;
- data on the growing stock according to age categories;
- destruction of fully stocked wood;
- valuable living communities of forest nature;
- endangered plants and animals;
- cuttings (cuttings, incomes and expenses, cuttings by development classes and methods of cutting, forecasts of the growing stock development by development classes, forecasts of the growing stock development by age categories, cutting by sub-compartments + proposed cuttings, thematic map);
- schedule of proposed works on forest planning and their cost;
- the possibility of obtaining a state subsidy for forest planning;
- thematic maps;
- data required for a forest use declaration.

Forest planning and calculations are based on forest planning data. In Finland, this forest planning data is collected during field work in the forest. The basic unit of forest planning is a sub-compartment (in most cases, an area from 0.5 to 2.0 hectares) homogeneous in terms of age, soil fertility, species composition and reclaiming conditions. Enumerative methods of taxation are

applied. The cross-sectional area of the growing stock on the allotment is taken as the weighted average of the representative subjectively chosen accounting areas. Trees are counted using a relascope. Then the forest manager determines the cross-sectional area of the average diameter tree for each species and for each tier of the growing stock. For this purpose, a diameter at chest height, height and age are set. Also, the minimum and maximum diameters for each part of the sample can be measured. In addition, features of the growing stock are recorded (biodiversity, landscape, recreational value, various damage).

In private forests, the forest planning includes both planning territories (for example, with a size of 4000 hectares) and sub-compartments (eg 1000 hectares) within the territories. The goal is to cover the forests around, for example, a certain village, in order to ensure a concentrated marketing of forest planning services, communication with forest owners and efficiency of work through the spatial organization of forest planning facilities. Plots (similar to quarters) are an element of coordinated actions during forest planning. For example, usually one designer is entirely responsible for forest planning within the sub-compartment. The annual territory of forest planning at a sub-compartment level throughout Finland is about 1 million hectares.

Forest plans are developed by thirteen forest centers. Although all the forests of the planning territories are covered by the forest planning at the level of the sub-compartment, only a part of the forest owners are willing to pay for their forest plans. The cost of the forest plan is about 18 euro/ha. Half of the cost falls on field work. However, due to state subsidies, the forest owners pay only a part of the amount. For example, in East Finland, the owner of a plot of 45 hectares of forest must pay 30 euro + 7.5 euro/ha for a forest plan prepared by a local forest center.

There are other actively developing methods of forest planning. Obviously, in the future, forest planning data will be collected only on the basis of remote sensing of the earth. With respect to forest planning, this means that it will be increasingly isolated from the forest management and, thus, the activity will be focused on planning calculations and on the goals of decision-makers. (1).

Sweden:

In Sweden, the area of forests used for the production of timber and pulpwood is 22.9 million hectares. Half of these forests belong to several large companies, and the second half is divided into more than 200 thousand private properties. Information on accounting for these forest resources is in demand at several levels:

governing bodies need summary information on all forest owners;

owners need more detailed information on their forests for compiling forest planning plans;

at the level of plantations, the information is regularly required on those parts of the forest where cutting is planned, or the cutting has recently been carried out.

As a matter of fact, the system of organization, methods and technologies of forest planning, applied in Sweden are the same as in neighboring Finland.

Sweden is the founder of the national forest inventory, this forest accounting technology was developed in the 20s - 30s last century and was subsequently extended to other countries.

The Swedish National Forest Inventory Program is based on the annual systematic description of field trial areas throughout Sweden. The goal of the program is to collect reliable statistics for 31 provinces (or for parts of provinces) using the five-year average results of surveys in field trial areas. Trial areas are located in groups on the sides of the square, each group consisting of 6 (12) temporary circular areas with a radius of 7 m or 8 permanent circular test areas with a radius of 10 m. Annually in Sweden, accounting of approximately 5,300 permanent and 3,500 temporary trial areas is maintained. Constant trial areas are re-examined once every 5-10 years. Since 1996, the coordinates of the trial areas are determined using GPS, which allows further sharing of plantation characteristics and pixel characteristics on satellite images.

As a basis for the inventory, public photos of Landsat are taken. Their use gives enough information about the territory, is not overloaded with small details and is convenient for deciphering homogeneous forest plantations (such a majority in Sweden). On each trial area, specialists who have passed competitive selection and special training, collect data characterizing the landscape, vegetation, soil, species diversity by two hundred parameters. Inventory has a five-year cycle. This allows to accurately know and closely monitor the state of forest plantations of the territory and plan forest planning activities.

New remote methods of forest planning and assessment of forest resources are actively applied.

State forest monitoring using satellite data is carried out using medium-resolution optical imagery from Landsat or SPOT satellites. This technology has been effectively used in recent years by the Swedish Forestry Agency and the Swedish State Forest Inventory Program. The Forestry Agency annually receives satellite images throughout the entire forest area of Sweden. The most important area of application of images is the control over the use of issued permits for cutting; since 2003, the boundaries of cutting areas in the area have been monitored according to the pictures. This work is carried out by local foresters (in about 100 forest districts) using a specially developed GIS and image processing programs that were developed.

The Forestry Agency analyzes the change detection using relatively calibrated images, where "forest" pixels are used as the spectral standards. For the implementation of this monitoring project,

an annual summer survey of the entire territory of Sweden by SPOT satellites was carried out in recent years. The snapshot database created in the course of the project can be effectively used to solve other forestry tasks, for example, for assessing the parameters of plantations by joint analysis of images and data from land trial areas of the national inventory.

The main part of the research on the use of remote sensing in forestry in Sweden is carried out at the Laboratory of Remote Sensing of the Swedish Agricultural University (SLU).

Geoinformation systems and remote sensing data of the Earth are widely used for a variety of purposes - from assessing the spread of forest fires to planning for forest use, placing forest roads, etc.

In order to assess forest resources, many remote systems are used - optical images of different resolutions, through which the territory is classified by type of coverage, radar images, and the LiDAR system for automatic 3D modeling of terrain models, laser scanning used to obtain the volume model of the growing stock, etc.

For detailed examination of small areas, unmanned aerial vehicles are actively used, which from a height of up to 250 meters, take pictures with a resolution of several dozens of centimeters. With the help of a special GIS program, it is possible to build a 3D model of the relief and forest plantations.

For the purpose of designation and planning of forest planning activities, classical forest planning is also carried out using the methods used in Finland. (2).

Czech Republic:

There are about 280 thousand forest owners in the Czech Republic, 60% - state forests, 40% - respectively, private. To provide forest owners with relevant and accurate information on forests, a two-level forest inventory and forest planning model is used - traditional forest inventory, classical forest management - forest planning.

The traditional inventory of forests in the Czech Republic has been carried out since 2001 by the state forest planning organization Brandis nad Labem. By now 3 cycles of the traditional inventory have already been carried out:

1st cycle - 2001 - 2004;

2nd cycle - 2011 - 2015;

3rd cycle - 2016 - 2020 - is currently performed.

Traditional inventory is conducted on more than 14000 trial areas with a repeatability of 5 years. With each new inventory cycle, the amount of data collected is greatly expanded, and modern remote methods of accounting - remote sensing of the earth's surface - are being introduced. A

comprehensive software product used to collect field data on trial areas is the national Field-map program.

Forest planning is carried out by private forest planning companies on a competitive basis. Based on the results of forest planning, a forest planning design or a forest planning basis for a period of 10 years is being developed. The forest planning design is developed for an area from 50 hectares to 20000 hectares, a forest planning foundation for an area of up to 50 hectares. The principal difference between the forest planning design and the forest planning foundation is that the forest planning foundation is given out to the forest owners to ensure rational and efficient forest planning, but if the forest owner does not conduct any forest planning activities in his forest, he may not receive a forest planning foundation in the local government. The forest planning design is a binding document that the forest owner orders and pays for in the forest planning organization for the implementation of forest planning and conducting forestry. The volumes of economic activities are indicated in the forest planning design - cleaning cutting, volumes, a list of forest species that need to be restored on cutting sites, volumes of fire fighting, forest protection and other measures.

In addition to the forest planning design and the forest planning foundation the state forestry enterprise Brandis nad Labem develops territorial development plans for the forests throughout the Czech Republic, which, in effect, regulate the basics of forest planning and conducting forestry, depending on climatic, territorial, forest typological and other factors. Since the influence of these factors on forests has a long-term period of time, the implementation period for such plans is up to 20 years.

Methods of forest planning are similar, as in other countries:

a continuous count of the trees on the sub-compartment;

laying of relascope platforms;

eye estimation of plantation taxonomic indices.

The cost of forest planning works, depending on the methods of forest planning, varies from 5 to 15 euro/ha.

To collect field forest planning data, the most common software is Field-map, but many private forest planning companies use other programs.

Russian Federation:

In accordance with the Forestry Code of the Russian Federation dated December 4, 2006 No. 200-FZ, forest planning and forest management of the Russian Federation is in fact a two-level system:

1st level - state inventory of forests of the Russian Federation;

2nd level - forest planning in local facilities, with observance of all state standards and norms.

According to Article 90 of the Forestry Code, the state forest inventory is a measure to verify the condition of forests, their quantitative and qualitative characteristics, and is carried out in order to:

- timely detect and predict the development of processes that have a negative impact on forests;

- assess the effectiveness of measures for the security, protection, reproduction of forests;

- information management of the use, security, protection, reproduction of forests, as well as in the field of federal state forestry supervision (forest service).

The state forest inventory is carried out by the authorized federal executive authority in respect of forests located on the lands of the forest fund and lands of other categories by terrestrial and aerospace methods.

The procedure for conducting state forest inventory is established by the federal executive body authorized by the Government of the Russian Federation.

The State Forest Inventory of the Russian Federation is carried out in the following areas:

- determination of quantitative and qualitative characteristics of forests;

- assessment of the effectiveness of measures to secure, protect, reproduce forests and use forests by terrestrial methods;

- remote monitoring of forest use;

- formation of federal information resources.

According to Internet sources, the order of carrying out, processing of registration data, the purpose of the State Forest Inventory collides with a lot of criticism from scientists, practitioners, leading foresters of the country. Features of GIL of the Russian Federation are as follows:

- the first cycle is conducted in accordance with the long-term program, designed for 15 years;

- it is based on the laying of a network of permanent trial areas;

- the data of the latest forest inventory and stratification of forests is used to determine the volumes of the land sampling and its location;

- the authors of setting tasks and algorithms for data processing are still unknown;

- in inaccessible areas, the representativeness of the ground sample is usually not ensured;

- is performed by FSBI "Roslesinforg" in accordance with the State order;

- is financed from the Federal budget;

- the current GIL technology is being sharply criticized by scientific and public organizations, its results do not find practical application.

The main problems of the State Forest Inventory of the Russian Federation:

the absence of the approved by the Russian Federation Government GIL Procedure (Article 90 point 5 of the Forestry Code of the Russian Federation), the current procedure is approved by the order of the Federal Forestry Agency No. 207 dated 06.06.2011;

earlier the GIL was carried out in accordance with the Resolution of the Government of the Russian Federation No. 407 dated 26.06.2007 "On Conducting the State Forest Inventory" and the Provisional Rules for Conducting Field Work on State Forest Inventory approved in 2007 by the Director General of FGUP "Roslesinform" V.G. Cresnov;

imperfection of the current Methodological recommendations for the conduct of GIL, approved by the order of Rosleskhoz No. 472 dated 10.11.2011;

design of GIL for forest areas, implementation of activities of the federal GIL project consistently for the subjects of the Russian Federation, data aging;

excessive requirements for the accuracy of the definition of timber reserves;

modern remote sensing methods in combination with ground-based measurements on trial areas are not used;

there is no rational method of forest inventory in hard-to-reach areas;

trial areas: overloaded with secondary measurements (117 indicators), all constants (i.e. in the next cycle GIL measurements will be on the same points) are not clustered (excessive waste of time and effort);

during statistical processing of the primary data of trial areas, non-traditional methods and software of Czech production are used;

for the calculation of taxation characteristics, a tree-based approach is used, not the calculations of the taxation characteristics of plantations;

methodological methods that are not used in national practice and are based on not quite clear concepts, such as "representative tree area", "normalized average stock", "virtual trees" are used;

as a result, the final data for calculating the quantitative and qualitative characteristics of plantations can have significant distortions in the real picture and can not be compared with data, for example, from the State Forest Registry.

Actually, forest planning is carried out on the lands of the forest fund, as well as on the lands of defense and security, the lands of settlements, on specially protected natural areas where forests (or urban forests) are located in accordance with the Rules for Conducting Forest Inventory, which are established by a forest planning instruction approved by the authorized federal executive body.

In accordance with Article 68 of the Forest Code, forest planning includes:

design of forest districts and forest parks (their boundaries are established, the division of forest districts, forest parks into zonal forest districts, the definition of a quarterly network);

the design of operational forests, protective forests, reserve forests, as well as specially protected forest areas (carried out for the purpose of subdividing forests into species for their intended purpose and allocating specially protected forest areas, the boundaries of operational forests, protective forests and reserve forests are established by quarterly clearings, forest quarters boundaries and forest taxation taking into account the natural boundaries of forest districts, forest parks, the design of specially protected forest areas in operational forests, protective forests and reserve forests are carried out in order to identify areas of forests that are important for coastal protection, soil protection and other functions. The boundaries of such forest areas are set according to quarterly clearings and boundaries of forest areas, taking into account natural boundaries, as well as forest taxation divisions);

design of forest plots (the preparation of design documentation on location, boundaries, area and other quantitative and qualitative characteristics of forest areas is carried out, the location, boundaries and area of forest areas are determined respectively by forest quarters and/or forest taxation areas, parts of forest taxation sub-compartments, their boundaries and area);

fixing the boundaries of forest districts, forest parks, operational forests, protective forests, stand-by forests, especially protective areas of forests and forest areas on the terrain;

forest taxation (carried out to identify, account and assess the quantitative and qualitative characteristics of forest resources, with the taxation of forests conducted within the boundaries of forest areas, forest districts and forest parks, the boundaries of forest taxation are established, the prevailing and associated tree species are identified, the diameter, height and volume of timber, forest conditions, the state of natural renewal of tree species and underbrush, as well as other characteristics of forest resources);

design of measures for the security, protection, reproduction of forests.

In accordance with Article 70 of the Forestry Code, the performance of work, forest planning services are carried out in accordance with civil law. Bodies of state power or bodies of local self-government shall purchase activities, services for forest planning in accordance with the procedure established by the legislation of the Russian Federation on the contract system in the sphere of procurement of goods, works, services to ensure state and municipal needs.

Just like the State Forest Inventory, the forest planning of the Russian Federation is criticized by practitioners and scholars of Russia for a number of reasons:

forest planning is not based on a long-term program and is mostly unsystematic, mosaic and shallow-contour nature;

old obsolete technologies are used that do not take into account the latest achievements of science and technology in the field of remote sensing;

annual scope of work is insufficient to meet market needs;

is carried out by the winners of competitive and auction procedures, as well as by direct agreements with tenants of forest areas;

financed by subventions from the federal budget and tenants of forest areas.

Poland:

The organization of the forest inventory of Poland is similar to the countries discussed above.

For a reliable assessment of forest resources on a countrywide scale, since 2005, the Polish Forest Inventory and Forest Geodesy Bureau has been carrying out a national forest inventory. The national inventory is carried out on the network of permanent test areas for monitoring the Pan-European ICP FOREST network 16 x 16 km (individual trial areas are designed according to the network scheme of 4 x 4 km tracts).

Trial areas, like in the Czech Republic, are noted in a hidden way, they are used to record and assess the state of growing stock, tree and shrubbery vegetation, estimate the amount of forest use (actual and projected by the forest planning for the forthcoming period), volumes of dead and fallen wood are measured, as well as the other indicators. The national forest inventory is carried out with a cycle of 5 years; the second inventory cycle has now been completed.

For planning and designation of forest planning activities in order to achieve a balanced and rational forest planning in Poland, a forest inventory is organized according to classical schemes. The forest planning design is developed for a period of up to 10 years and must comply with the requirements of environmental, forest legislation, and provide an economically sound approach to the organization of forestry. The forest planning plan may be amended in agreement with the Ministry of Environmental Protection (for state forests) or voivode (in other cases).

The forest inventory plan includes:

a general description of the forests of subforests district;

analysis of economic activity;

taxation description of allotments;

a list of all forest planning measures, their volumes, which are required to be carried out during the audit period;

volume of cutting of main and intermediate use for the revision period;

forecast of the impact of forestry activities on the environment;

a program for the security and protection of the environment;

economic calculations of activities and forest use;

justification of subsidies, which must be received by a forestry establishment for the implementation of projected forest planning activities;

cartographic basis.

For forests that are not state forests, a simplified forest planning design is prepared that contains a brief description of forests, forest lands designated for reproduction and management of forestry, and a short list of activities designed to ensure rational and sustainable forest planning.

Methods of forest planning used in Poland:

laying of relascope platforms.

At the present time, in the process of forest planning, aerial photographs and satellite imagery are used in practice, as well as orthophotos produced on their basis. Everywhere, GPS receivers, electronic diameter measurement systems, recorders and digital cards with the appropriate software are used. In addition, Polish forest managers are directly involved in research forest works, the introduction of new technologies, for example, in improving the principles of accounting for wood resources, laser aeroscanning and other technologies.

The Forest Inventory and Forest Geodesy Bureau has established a Forest Data Bank which contains information on all Polish forests irrespective of their form of ownership.

The forest data bank consists of the following portals:

accounting portal;

reporting portal;

Internet portal.

The Data Bank accumulates information about the forest fund, obtained from various sources - state forestry organizations, scientific organizations, private entities, individuals, environmental communities, and other sources. Information about forests from the Data Bank is available from the GIS. Cartographic information is stored in the ArcView coverage format and is linked to a topographic basis. (3).

Conclusions and recommendations: an analysis of the features of the organization and implementation of forest planning in Finland, Sweden, the Czech Republic, Russia and Poland shows that in almost all the countries under consideration a practically similar two-level organizational model of forest planning is used:

national forest inventory;

forest planning (classical forest planning).

In forest planning, well-known methods of taxation (eye, continuous counting, laying of relascope sites) are applied, depending on the required accuracy.

For all countries, including Belarus local application of elements of remote methods for characterizing forests is common, geoinformation systems are widely implemented and modern electronic equipment is used - GPS receivers, electronic altimeters and diameter measurement systems, recorders and digital maps with appropriate software. Based on the results of the forest planning, forest planning plans are being developed in which the volumes of the main forest planning activities and cutting are given, differing in different countries and regions, as a rule, by the target set of data, sheets, etc. necessary for the particular forest owner.

Multilevel organization of the system of forest planning with the national inventory can be considered more as a forced measure in countries with a large number of forest owners, including private ones. For example, in Sweden the number of forest owners is more than 200 thousand, in the Czech Republic - more than 280 thousand. According to the legislation of European countries, in the absence of any planned economic activity, forest owners are not obliged to carry out forest planning, accordingly, there will be no information on forests in such cases. Thus, in order to obtain up-to-date, reliable information about the state of the country's forest fund, the efficiency of forest planning, the provision of this information by authorities and the formation of information resources, the governments of the countries resort to the statistical method of accounting for forest resources.

In Russia, the situation is different because, due to the large area of forests and the lack of budget financing, forest planning with land-based elements of taxation is not actually conducted on the entire forest fund area. Information on the area of the forest fund on which forest inventory was conducted during the last revision period (10 years) with entering each sub-compartment in different sources varies significantly. Reliable data can not be managed even by leading forestry experts of the Russian Federation. For example, on the official website of the Union of Foresters of St. Petersburg, the leading forestry scientist of Russian Federation R.F. Treyfeld in the article "Between the Forest Planning and the GIL" indicates that the share of legitimate, non-overdue forest planning materials today does not exceed 10% of the total forest area of the intensive forest use zone according to Roslesinfog - 24%, but this together with cameral actualization, which is not a full-fledged forest planning) (16). In addition, despite the state ownership of forests in Russia, and de jure the forest ownership of state forestries, a large part of the forest has been leased to a number of private forest users. In the forest fund of Russia there are about 9.3 thousand administrative and economic units - objects of forest inventory (1.8 thousand forestries, former forestry enterprises,

and 7.5 thousand zonal forest districts). I.e. here the factor of plurality of forest owners is triggered too.

In Belarus, there are no so many forest owners as in the countries under consideration, and forest planning according to the classical scheme is carried out throughout the entire forest fund every 10 years with a visit to each sub-compartment. Of course, from the date of approval of the forest planning plan, the relevance of the data is reduced, but it can be concluded that no matter how representative the sample was, accounting of forest resources in the scale of the country, with a visit to each sub-compartment, is the most accurate way for Belarus. Currently, the question of assessing forest resources in Belarus is not urgent. Therefore, carrying out a national forest inventory in the country today will not give a proper positive economic effect.

The Belarusian state forestry enterprise Belgosles confirms "that the so-called "national forest inventory", once approved by RUE" Belgosles" in the forest fund of the republic in 1998 in the forestry enterprises of the Grodno SPFE, by laying a certain system of permanent radius areas and determining the taxation characteristics on them, turned out to be inappropriate in the system of high-level forest registration, design and mapping."

Today, the national forest inventory for the conditions of the Republic of Belarus is of more interest for scientific purposes. Indeed, according to Internet sources, the forest fund indicators on a national scale, calculated from the data of statistical studies and materials of forest planning, differ to a large extent (discrepancies in individual indicators are up to 50% or more, and as a rule, the statistical method increases the value of the indicator) and it would be useful from a scientific point of view to compare the data on the stocks of tree species obtained by different methods (statistical method and forest inventory).

Since the statistical method can increase the estimated timber reserves in the country, the positive economic effect in this situation can be achieved in the foreseeable future after the ratification of the Paris Agreement on Climate and the Assessment of the Potential of Belarusian Forests for the Absorption of Greenhouse Gases by International Climate Funds.

With regard to the use of modern geo-information systems, GPS receivers, electronic altimeters, diameter measurement systems, recorders, digital maps with the appropriate software, unmanned aerial vehicles in the countries under consideration, it can be noted that such technologies have been successfully introduced in Belarus, and the expansion of their use will be is considered in Section 2.3. of this work.

2.2. Preparation of proposals for improving the quality of forest planning design, including the use of new technologies for collecting field data (sampling method and field measurement of areas); the use of various available data sources (such as satellite imagery, both from free access and commercial, digital aerial photographs, LIDAR, digital surface models, GIS systems and databases, etc.), and data storage and processing systems, software (comparing open source software and proprietary software), and the dissemination of information through web portals

The experience of European countries shows that with the development of space technologies, remote sensing of land, digital systems for data collection and processing, forest planning technologies have also undergone significant changes. Today in the developed western countries and in Russia various new technologies of forest inventory, collection of taxation information are applied. In this section, in accordance with the terms of reference, examples of the most common technologies and means of forest planning (**LIDAR aerial laser scanning of the surface, unmanned aerial vehicles, automatic photo interpretation, ArcGIS software packages, Field-Map, technologies of national forest inventory, etc.**) are considered. Depending on the required forest planning information and its accuracy, it is possible to apply it to some extent in the conditions of Belarus (17).

1. LIDAR aerial laser scanning of the earth's surface allows obtaining three-dimensional data containing complete spatial-geometric information about the terrain, forest and vegetation cover, hydrography. This technology allows monitoring of forests and biomass. Space (for example, GLAS - Geoscience Laser Altimeter System) and aviation lidars allow to determine the height of the forest cover. Thus, with the application of the technology under consideration, **it becomes possible to clarify the distribution and area of forests, calculate their taxation parameters (wood stock, completeness, height of the main forest canopy)** and monitor the dynamics of the forest fund.

Figure 1. LIDAR aerilr laser scanning of the earth's surface



The technology of laser scanning has been spreading since 1991 in the Scandinavian countries (Finland, Sweden, Norway) in the inventory of forests. Two main forest inventory methods based on laser scanning have been developed. Using laser data of low registration density (about 1 laser pulse per square meter), it is possible to reveal statistical relationships between measurements in field areas and the characteristics of data obtained from the laser. Thus, the revealed patterns of the statistical distribution of tree heights can then be used in all plantations where laser scanning was performed. This method provides estimating of the stock of trunks with standard uncertainty of 10-15% (4). Commercial use of laser measurements for forest inventory was first carried out in Norway. The first industrial test in Sweden was conducted in 2003, when a 5000 hectare area was surveyed with a laser (5). The standard uncertainty at the stand level was 14% for barrel volume, 5% for tree height and 9% for average diameter.

A fundamentally different approach is laser scanning with a density sufficient to produce a set of laser pulses per tree to determine individual trees, which requires a density of about 5 pulses per square meter or more. At present, such data is mainly obtained from scientific research from a helicopter, but the technical developments that allow obtaining data from a very high-density laser sensor from fixed-wing aircraft are a very promising option for subsequent forest surveys nationwide. The contribution to this development is the evolving technology of using a video converter, which uses many sensor elements to record the return signal from each laser pulse output. One such study was conducted in Sweden in a forest with a predominance of coniferous species.

Using a high-density laser sensor, it was possible to identify more than 70% of all trees, which totaled more than 90% of the stock of trunks. The height of the trees and the diameter of the crowns were also determined automatically, both indicators being accurate to 0.6 m. Using the characteristics of tree crowns, automatically obtained from laser scanning data, it is possible to divide pine and spruce with an accuracy of 95%. Laser data used in conjunction with optical imagery allows more accurate determination of tree species, evaluation of barrel diameter distribution using a high-density laser sensor, and segmentation of plantations in photographs.

Equipment for laser scanning consists of:

scanning unit - receiving and transmitting device of laser pulses;

the navigation complex, including the Global Positioning System GPS or Glonass, the IMU inertial system, which in joint operation gives synchronization to the operation of the scanning unit and obtaining the exact coordinates of each laser reflection point along the XYZ axes;

baseline ground stations for precise positioning of GPS-GLONASS;

software.

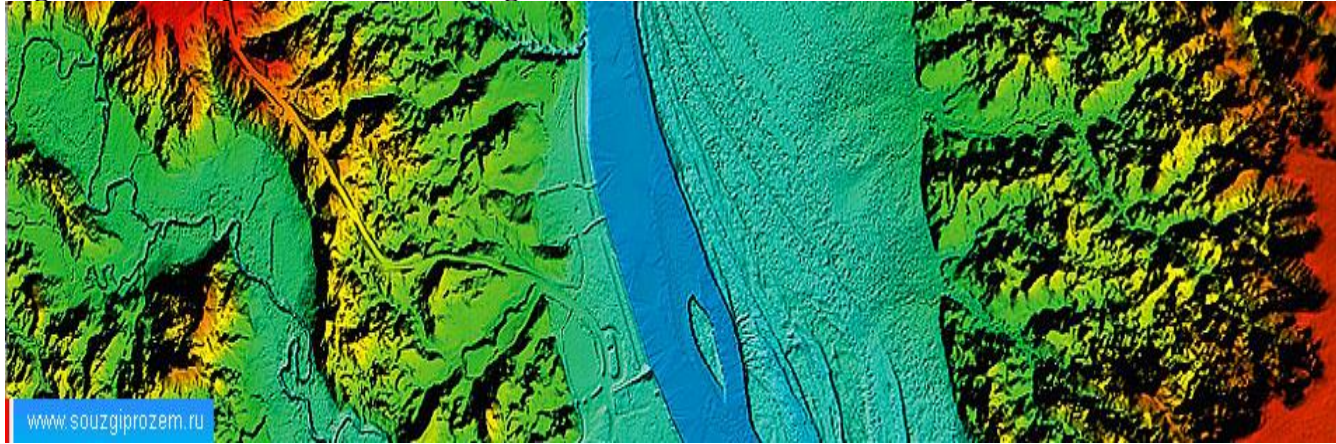
Figure 2. Equipment for laser scanning



The high-precision air laser scanner Leica ALS-50-II is able to efficiently operate both at small and large shooting heights, while ensuring consistently high accuracy of laser data and a high density of points. The innovative Multi Pulse In Air (MPiA) technology in the scanner ensures simultaneous presence of two laser pulses in the air, which doubles the performance of the scanning system.

Aerial laser scanner Leica ALS-50-II provides obtaining the densest cloud of points on the earth's surface with high accuracy of geospatial coordinates up to 10-12 centimeters. This laser scanner has the capability of lidar shooting both from low altitudes up to 200 meters, and from great heights - up to 6000 meters, which provides a fairly wide range of use of this equipment.

Figure 3. A sample of a lidar shooting of a forest fund and a water body



Advantages of Leica ALS-50-II air scanner

The main advantages of the Leica ALS-50-II air laser scanner are the following:

a wide range of possible laser scanning angles;

the possibility of shooting from high altitudes - up to 6000 meters;

high planned accuracy of position determination of laser reflection points;

high accuracy of determining the heights of laser reflection points even at high flight altitudes;

the presence of MPiA (Multiple Pulses in Air) technology, which allows obtaining a high density of laser reflection points even at high survey heights.

It is not possible to bring the full cost of the equipment under consideration for carrying out forest measurements and software to it, due to the exclusivity and specificity of the request for its target production and program development. This issue can be solved through negotiations with the software manufacturer and developer. It is enough to say that these are very complex measuring and software modules, stuffed with electronics and extremely expensive. Nevertheless, with their effective use, the cost is justified by high accuracy, productivity and efficiency in operation.

Conclusions and recommendations: the technology of air laser scanning with the use of lidars allows you to accurately determine the taxation characteristics and stocks of plantations with an error of up to 15%, which is a permissible level for the conditions of Belarus. Its main advantages are high productivity, reduced labor costs, work time, high quality and accuracy in large and hard-to-reach areas (the accuracy of materials is up to 15 cm when working from a height of 1500 m and 5 cm from 500 m). On the other hand, the technology is quite expensive and requires significant financial costs, especially at the initial stage for the purchase of equipment, software packages, and personnel training. According to Belgosles, a similar "method of laser scanning with a three-dimensional image and multispectral orthophotography has already been presented in Belarus by the Latvian company METRUM and is useful for obtaining point information, but not for application for the purpose of assessing forest resources on large areas." As for the profitability

of the technology, according to Internet sources: "The exceptional profitability of air laser scanning begins when working in flat areas with an area of 5 sq. km. Naturally, like aerial photography, air laser scanning with increasing area becomes more cost-effective in linear dependence.

The economic effectiveness of air laser scanning is not only in fairly short terms of execution, but also in obtaining data beyond the designated boundaries of the object, which, when making changes to the existing design and project documentation, will not affect the increase in cost from remote methods. Obtaining data for the topographic base is done without fieldwork in full." (12).

As a rule, in forestry, laser scanning is used in carrying out national forest inventories. Therefore, in modern conditions of Belarus, with the coverage of 100% of the forest fund by classical land-based forest planning technology, the use of laser scanning technology is not economically justified. In case of development of elements of the national forest inventory, if such necessity arises, it is possible to consider laser scanning as one of the means of forest inventory. In this case, in order to obtain a synergistic effect and optimize costs, it is most advisable to carry out works jointly with geodesic organizations, land management services, agricultural organizations for which the scanning of the earth's surface is of no less interest.

2. Unmanned aerial vehicles. The technology of unmanned aerial vehicles makes it possible to significantly simplify the work when conducting a survey of forest resources, forest inventory on significant areas damaged by natural factors, fires, forest diseases. The use of such technologies has recently become quite promising and is gaining increasing popularity, particularly in the forests of the Baltics and Russia. For the conditions of Belarus, the use of quadcopters has a positive economic effect, since the cost of one quadcopter averages about \$ 1,000, and the software product for processing averages about \$ 2,000, especially since it has already been developed by the domestic company. In general, taking into account the above, the use of unmanned aerial vehicles in Belarus is promising.

Figure 4. Unmanned aerial vehicle (quadcopter)



Figure 5. Unmanned aerial vehicle (quadrocopter)



Figure 6. Unmanned aerial vehicle



Figure 7. Unmanned aerial vehicle



Aviation method of forest planning is one of the most attractive, combining high productivity and accuracy of work, their targeting, low cost of work.

Radio-controlled unmanned aerial vehicles equipped with a photo and video camera with the required resolution and technical characteristics can provide automation of a number of works related to forest planning:

operational survey of cutting sites and other economic activities in forests (in the mode of photo or video documentation); these works can be carried out by the forest planning organization, forestry enterprises, forestries;

forest-pathological taxation of the state of forest fund plots (in the mode of photo or video documentation) in order to identify diseases and lesions of plantations;

planned aerial photography of large areas of forest stands for forest planning;

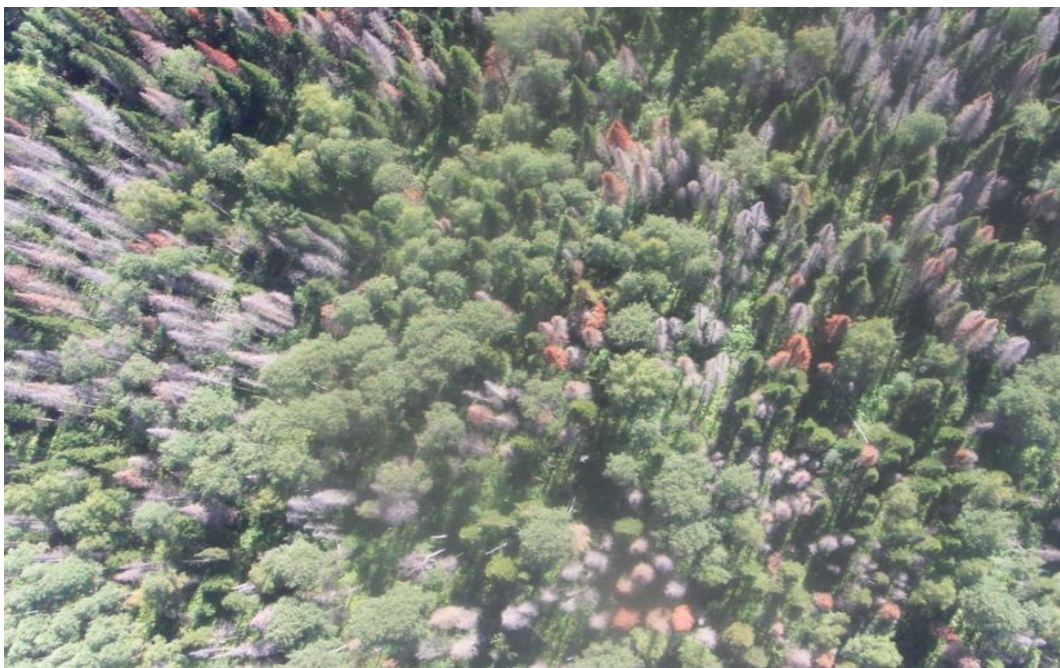
targeted aerial photography of small forest areas on the order of the forestry enterprise for making changes to the forest management plans ;

local aerial photography of forest areas commissioned by the forestry enterprise for the purpose of establishing forest sites damaged as a result of natural phenomena, fires, forest diseases.

Figure 8 shows Image of plantation and logging area from the camera of an unmanned aerial vehicle

Figure 8. Image of plantation and logging area from the camera of an unmanned aerial vehicle





Today, the market offers, depending on the size, required specifications, equipment, a wide range of unmanned aerial vehicle modifications, and their cost starts from several thousand dollars to dozens and hundreds of thousands.

For the purposes of forestry, it is necessary to use apparatuses specialized for aerial photography that meet the following technical characteristics:

- flight time - not less than 90 min;
- the speed of the flight - 65-120 km/h;
- the radius of the radio link - at least 6 km;
- the maximum flight range - not less than 100 km;
- the mass of the aircraft - not more than 4.5 kg;
- the wing span of the aircraft - 1.6 m;
- working altitude of the flight - 50-500 m;
- the deployment time of the complex - 10 minutes;

Operating conditions (wind up to 15 m/s, ambient air temperature from -30°C to + 30 °C, moderate rain and snow);

- take-off - with the help of an elastic or mechanical catapult;
- landing - on a parachute in automatic or semi-automatic mode;
- platform for take-off and landing - 100x100 m;
- flight modes - flight in automatic or semi-automatic mode.

The characteristics of a digital camera:

- the total number of pixels of the matrix is not less than 10 million;
- sensitivity (ISO) Auto, 100-1600;

focal length 28 mm;
 exposure 30 - 1/4000 s;
 type of memory card - SD;
 image format - JPEG;
 USB 2.0 interfaces;
 built-in image stabilizer.

The software must provide the planning of the flight (route), automatical calculation of the length of the flight path, the time on the route, check the flight task for compliance with the operating limitations of this device with the specified parameters:

object type - area or extended object;
 specified speed of the vehicle;
 required overlapping of pictures - shooting frequency;
 altitude above ground level;
 the angle of the aperture of the camera lens.

Conclusions and recommendations: in Belarus for the purposes of forest planning, assessment of the state of the forest fund, the use of various modifications of unmanned aerial vehicles is a promising direction. It is most advisable to apply these technologies for local assessment of forest resources, damaged by natural phenomena, fires, forest diseases, windfalls, blowdowns in an area of several dozen hectares or more. The forestry enterprises can use the technology to monitor fire hazards. Based on the data obtained, it is possible to plan forest planning activities, prepare a cartographic basis for making changes to forest planning projects. Also, provided that the camera is equipped with a high-resolution camera, this technology may be of interest for obtaining aerial photography for the purpose of basic forest planning.

The use of this technology assumes a positive economic effect due to the affordable cost of the device, the ease of its management and maintenance, excluding the costs of conducting a ground survey of the forest fund. At the initial stage of the use of aircraft, it is most economically profitable and efficient to rent them or order services for surveying the territory.

3. Automatic decoding of aerial photographs is based on the "template matching method" developed by Richard Pollock in Canada (Pollock, 1996). This method is based on the creation of synthetic tree patterns, which are then analyzed taking into account possible viewing angles and corresponding lighting at different positions in the picture. Further, the template trees are compared with the potential trees in the image using the correlation method. By using the "method of standards" the activities were carried out in the coniferous forests of Sweden, and it turned out that it is possible to identify and position approximately two thirds of the trees in the picture. In the future,

using the brightness of pixels of certain kinds on a digital photo (identified by the standard method), it is possible to divide spruce, pine and deciduous trees in 90% of all detected trees.

Currently, the method of deciphering in forest planning using various software products is quite widespread in a number of countries, including Russia.

The technology of stereoscopic forest taxation is proposed to be considered using the example of the special program module Photomod Stereo Measure, especially since this method of photogrammetry is also widespread in European countries.

At the first stage, an aerial or cosmic stereoscopic survey is performed, orthophotomaps are created, tied to a cartographic basis.

At the second stage, a digital cartographic base is created on which stereoscopic contour, analytical and measurement interpretation is performed using the Photomod Stereo Measure module.

At the third stage, a geoinformation system (GIS) is formed - the introduction of electronic taxation cards based on the already deciphered branches, the formation of a geo-information database, the printing of forest maps, map-boards, orthophotos, taxation descriptions.

At the fourth stage, the volume indicators are calculated according to the types of forest planning activities, forest exploitation, and a forest planning project is being developed on their basis.

The technology of stereoscopic taxation is most interesting for the conditions of the Republic of Belarus. With the use of this technology, it is advisable to carry out taxation in forests with a low intensity of forest planning and forest exploitation located in hard-to-reach areas of the forest fund, in bogs, in forests of specially protected natural areas, territories exposed to radioactive contamination.

Figure 9. The main stages of work with stereoscopic forest taxation



To develop a method for deciphering the taxation characteristics of forest plantations using modern materials for aerial and space stereoscopic surveys, it is necessary:

to analyze the information capabilities of the aerial and space images available in the republic (digital, stereoscopic) for the purpose of obtaining the taxation characteristics of forest plantations or to focus on the purchase of an imported survey;

choose the optimal software product for the purposes of stereoscopic interpretation of the taxation characteristics of forest plantations that meets the following criteria:

- formation of stereopairs of digital images of remote sensing data;
- work with stereo images (analysis of materials of multispectral surveys using special equipment);
- the ability to perform analysis of the features of forest decoding, including the stereotyping of heights, tree crown sizes, gaps between them and other geometric and morphological taxation and deciphering indices of trees and canopy);
- creation of vector layers when working in stereo mode (with the ability to import and export to popular GIS formats);
- the possibility of line work;

to prepare the necessary legal and regulatory framework;

to develop a method for contour, analytical and measurement forest interpretation based on digital aerial and space stereoscopic images in an automated (interactive) mode;

to develop a practical manual for the taxificator-decryptor.

Conclusions and recommendations: the technology of automatic image decoding today is one of the most promising directions for the development of modern forest planning and inventory of forests in the world, including the conditions of the Republic of Belarus. Belarus, according to Belgosles, despite full coverage of the forest fund with land-based survey methods, is also considering the introduction of the decryption method into production - the decoding technology for the Belarusian forest inventory is being developed as part of research work commissioned by the Ministry of Forestry.

Modern ground scanning technologies allow obtaining sufficiently accurate high-quality images that exceed the required resolution for forest inventory purposes. Accordingly, the cost of such a survey is quite high. Therefore, in order to optimize the correlation of price - the required accuracy of taxation, it is necessary to determine which pictures to use at the initial stage of the scientific work being carried out. The results of studies conducted by Russian scientists show that digital aerial photographs with a resolution of 30 cm, and especially with a resolution of 10 cm, allow getting very detailed interpretation. In other words, from pictures with a resolution of 30 and 10 cm, it is possible to clearly discern forest plantations and tree species and to carry out deciphering with a high degree of accuracy and reliability.

In the European Union countries, where field research was conducted on this issue and 30 and 10 cm photographs were also used, the cost of deciphering for 1 ha is comparable to the ground field works, and due to the additional purchase of expensive decoding equipment at the initial stage works often exceed them (one example of the research carried out in Croatia will be discussed in the next section).

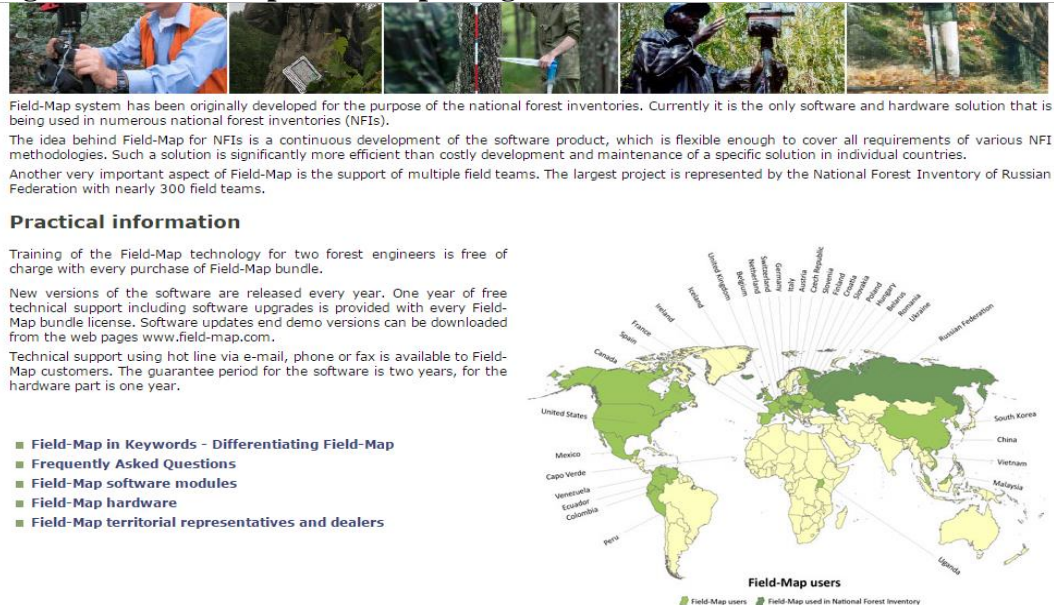
The economic efficiency of the deciphering method in Belarus should be ensured by an optimal correlation between the required quality of the taxation and the costs of its implementation, taking into account the purchase of an expensive forest planning basis. In our opinion, taking into account the fact that in Belarus the area where economic activities are conducted are taxed by land-based methods of taxation, and the cost of images occupies a rather high share in the total cost of inventories by deciphering method, it is most expedient to use a survey with a resolution of 30 cm and lower without significant loss quality.

4. Field-Map software package is a technology for collecting forest data in the field and for processing data. The technology was developed in the Czech Republic, patented and is already being used in 30 countries of the world to collect primary forest data for forest planning and forest inventory. Field-Map combines a flexible real-time GIS program and electronic measuring instruments for mapping and dendrometric measurements. With the help of wireless

communication, the data from the measuring devices are fed into the electronic taxation card (without special data entry) and accumulated in the database. The software package allows:

- to carry out a full range of forest inventory work;
- to analyze the stock and quality of the standing wood;
- to collect and analyze data for the purpose of forest planning activities, forest exploitation
- to perform mapping of forests and landscape elements.

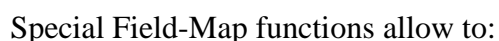
Figure 10. Field-Map software package



The advantage of Field-Map technology is that it allows to transfer measurement data from electronic and laser measuring instruments directly to the database of the field computer and display them on the screen in the GIS.

Databases and electronic maps created in the field are then easily transferred to the central GIS without additional preparation and processing.

Field-Map technology is a flexible system that allows to easily change the structure of the database: the user has the ability to select and assign parameters and indicators that will be displayed on the map or recorded in the database. In this case, the types of measured indicators and the structure of databases can be changed by the Field-Map user depending on the survey tasks, new indicators for measurement can be added directly in the field (by selecting them from the list or creating completely new types of indicators). It is important that to do this, the user does not need to be a database specialist or a programmer - the creation of databases is based on the principle of templates and step-by-step actions.



map projections and measure the shape of tree crowns;

measure the diameters of tree trunks at any height and automatically calculate the volumes of trunks;

automatically calculate line lengths, perimeters and polygon areas;

verify the reliability of the collected information and monitor the completeness of databases
field work;

visualize measured objects in three-dimensional graphic space;

create digital terrain models, and also solve many other tasks related to the processing of
ses and GIS in the field.

To process the data received, you can use a special Field-Map application - DENDRO, you can also export data from Field-Map (maps and databases) to other programs. Because Field-Map uses ESRI format as a data format, data can be processed without problems by many GIS programs.

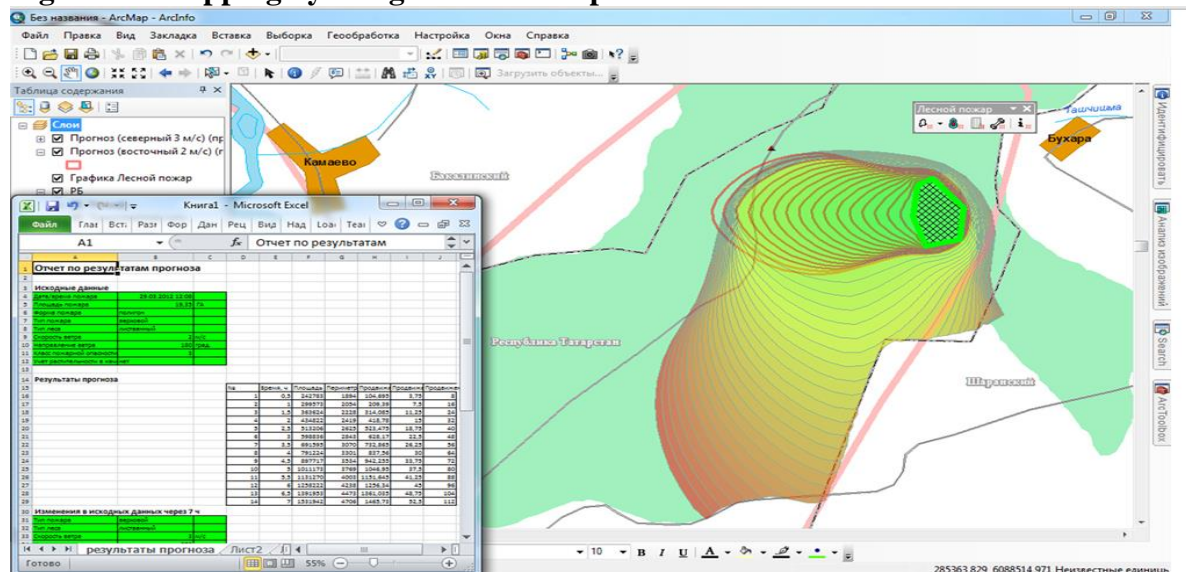
Conclusions and recommendations: today the software package considered is the most progressive program for the implementation of a complex of forest planning and forestry activities, which has spread in many developed countries of the world and is proposed for use in the conditions of the Republic of Belarus. However, this does not mean that only this program should be used. In accordance with the terms of reference, the Field-Map examines all the necessary components for conducting surveys in the forest - from input of primary taxation data to an electronic taxation card

prior to forest mapping. The application of such a program in the Belarusian forest planning will significantly reduce the process of processing taxation cards, mapping of forests and developing a forest planning project in the end. Due to the automation of these processes, the development of the cartographic basis of the object of forest inventory can be completed already in the year of field work. The number of table-top services that process data in the post-field period can be significantly reduced, which will result in a significant positive economic effect and a reduction in the cost of forest planning in general.

5. The ArcGIS software package is the most common software product that allows processing of the received primary forest planning data (the family of geoinformation software products of the American company ESRI, which is used for land cadastres, for the task of land management, forest planning).

ArcGIS is a system for building GIS of any level and makes it easy to create data, maps and models in desktop software products, then publish them and use them in desktop applications, in web browsers and in the field, via mobile devices. For developers, ArcGIS provides all the tools they need to create their own applications.

Figure 12. Mapping by using the Field-Map software



The geodatabase is an ESRI model that defines the structure and rules for storing different types of data - vector and raster, address points and many others.

The technology allows effectively storing heterogeneous data and ensuring their use. In the geodatabase, users can define rules and relationships within the depository that define the behavior of spatially interconnected geographic objects and object classes and ensure the integrity of the data.

The geodatabase allows editing both in multi-user mode and in stand-alone mode, with the option of synchronizing versions.

Exporting a geodatabase to XML format allows transferring the entire geodatabase or its individual elements (for example, tables, domains, topology rules) into the format that is available for other applications.

The program allows producing high-quality cartographic products with all the necessary elements of border break, using transparency, own or ready-made standard symbols, hatches, graded symbols, cartograms and diagrams. Automatic generation of network object diagrams, representation of time-varying data, and the possibility of 3D visualization, extending the scope of GIS applications, is available.

In ArcGIS, you can quickly create a realistic virtual 3D scene based on spatial data, both locally and regionally, using digital terrain models, space and aerial photographs, any vector data and photorealistic object models.

You can work with 3D objects in the same way as with standard GIS-layers - to make sampling, to receive attributive information, to design scenes in accordance with the tasks assigned.

ArcPAD allows the on-line collection, offline editing of spatial data in the field using GPS receivers, digital cameras and other devices. ArcPAD is integrated with ArcGIS desktop products (ArcView, ArcEditor, ArcInfo), works on mobile devices under the control of Windows CE, Pocket PC.

Conclusions and recommendations: ArcGIS today is one of the most widespread progressive software product in the world. In comparison with MapInfo, ArcGIS is more time-consuming to use, but also allows to perform a wider range of actions when mapping projects, provides 3D visualization and is usually integrated with many modern software products common in the world that provide primary information collection. The possibility of using the ArcGIS package in the Republic of Belarus should be considered in a complex, depending on the solution of the application of other program complexes. For example, if you use the Field-Map software package, it is advisable to use ArcGIS, which is compatible and has already been adapted for this program. In other cases, it is possible to use other packages, for example, MapInfo.

6. The forest-building base (aerial photography) - the state-owned enterprise Republican Agricultural Unitary Enterprise for Aerial Photography "Belarusian Enterprise of Agricultural Aerial Photogeodetic Researches" purchased the digital topographic wide-format aviation scanning sensor ADS100 manufactured by the Swiss company "Leica Geosystems AG", which allows to provide the forest planning with high-resolution digital spectrozonal surveying for solving the tasks of forest inventory and forest planning.

AP projects are compiled from scanned topographic maps, available orthophotomaps or satellite imagery and allow obtaining an aerial survey plan carried out in the Ascot navigation

system. As a result, it becomes possible to accurately realize the planned routes and survey points, and the determination of the coordinates of the photographing centers makes possible the further processing of aerial photography materials that reduces the volumes of ground binding and improves the quality and accuracy of photogrammetric processing.

Aerial photography is carried out from the board of the aircraft AN-2, re-equipped for aerial photography. The aircraft allows the installation of an aerial survey complex, which includes a gyro-stabilizing platform PAV-30, an aerial camera RC-30, a course setting sight, an ACU computer, a GPS antenna and Ascot navigation system.

Aerial photography is carried out according to the project, compiled in the Ascot program. The GPS system installed on board helps to maintain the direction of the flight lines of the aircraft in accordance with the planned scheme of the flight and thereby ensure the high quality of aerial photography.

Conclusions and recommendations: the survey obtained with the ADS100 fully ensures the quality required for forest planning, does not require obtaining a forest planning basis from other sources.

7. The technology of national forest inventory, which is widely applicable in a number of countries, is a statistical method of accounting for forest resources.

The main principle of forest inventory consists of periodic observations on the state of forests, measurement of its taxation characteristics on the network of laid test areas. The results of the inventory are transferred to significant areas and statistical indicators determine the indicators characterizing forests at the level of the region, the part, the country, etc.

The information obtained from the results of the inventory is used to make decisions in the field of forestry.

Inventory of forests on the one hand is a compelling measure for obtaining complete and reliable information on forests on a countrywide scale, in which a large number of forest owners, including private ones, are represented, who do not always carry out forest planning in forests that are in their possession and for this reason relevant information on such forests is absent, on the other hand, the national inventory allows the most reliable estimate of forest areas, growing stock, growth of plantations for a certain date, since forest planning plans are developed usually at intervals of 10 years or more can not provide relevant information about the state of forest resources.

Conducting a national inventory, as a rule, corrects the indicators characterizing the condition of forests, their accounting upwards to 30-50% or more.

Since the number of forest owners in the Republic of Belarus is not as significant as in other countries, carrying out a national forest inventory in our country, given the high cost of work, is not so relevant and cost-effective, but this will provide the most reliable information on the area of forests, current increment, assess the state of forest resources.

Conclusions and recommendations: as already indicated in section 2.1 of this study, since 100% of the country's forests are covered by terrestrial taxation for which there is complete reliable information, the application of the technology of the national forest inventory in Belarus today is of more interest for scientific purposes. To carry out a comparative analysis of the actual growing stock, estimated by the classical method of forest inventory and statistical method, it is possible to determine the limited local objects where it is possible to conduct inventory using a simplified technology, oriented exclusively to the establishment of growing stock.

The practice of carrying out national inventories in European countries shows that the growing stocks, calculated according to the statistic method, differ by up to 50%.

The conclusions drawn from the results of the study will be taken into account for possible re-evaluation of reserves throughout the country in the event of such a need and cost-effectiveness.

The economic effect can be achieved by increasing the potential of the Belarusian forests in the absorption of greenhouse gases. And, in case of opening the world market of carbon units, it is possible to attract additional financial resources to the country from potential buyers.

In general it should be noted that of all the technologies discussed above, which have become widespread in developed countries, for Belarus today it seems most expedient to force the introduction of technologies that will have a positive economic effect in the short term, including automatic decoding of photographs, expansion of the use of unmanned aerial vehicles, software update by analogy with the examined software products Field-Map, ArcGIS.

2.3. Preparation of proposals for the improvement of technologies, methods, ways of forest planning design, application of modern forest resource management for forest planning (taking into account the peculiarities of forest planning in the Republic of Belarus and economic efficiency)

The effectiveness of forest planning depends not only on the technologies and technical means used. An important factor on which the accuracy and quality of forest estimation directly with the optimal amount of money expended on this process is the correct choice of methods of

forest planning and taxation and their optimal combination. In accordance with the Rules for Conducting Forest Planning of the Forest Fund, the main method of forest planning in Belarus is the age class method. The primary accounting unit of the forest fund in forest planning according to the age class method is the taxation division, and the primary unit of account is the prevailing species. In forests with a high intensity of forestry, it is allowed to carry forest planning by the zonal method with the establishment of permanent economic areas as primary economic accounting units.

And although the forestry enterprises did not express interest in applying the zonal method of taxation, the experience of developed countries shows that it is advisable to use it in forests in which the economic activity is conducted in the most intensive mode. As the professor of Belarusian State Technological University, Atroshchenko O. states in his research in a market economy that the intensity of forest planning increases. In this case, the age class method in the forest inventory does not take into account the soil fertility of forest lands and the growth characteristics of individual plantations. It can become a brake in the development of forestry. In the aggregate of pine plantations (with a predominance of pine), mixed spruce-pine or birch-pine plantations can be included in rich habitat conditions that require other activities. Development of forest planning, organization and management of forestry, state registration of forests and rational use of forest lands is associated with a gradual transition to the local method of forest planning. The zonal method of forest planning is widely used in foreign countries: permanent economic areas (PEAs) with soil mapping and targeted forest growing in Germany, forest inventory and forestry planning on a soil-typological basis in the Czech Republic and Poland, Finland and Bulgaria. In Belarus, a soil-typological survey of forests has been carried out, soil maps for forest areas, maps of target tree species, electronic soil maps for each forest enterprise have been compiled, and the optimal species and age structure of forests in forestry institutions has been developed.

The zonal method of forest planning provides the organization of permanent economic areas as a set of taxation sub-compartments (or a separate area), territorially united by the generality of the conditions of the site, targeted forestry and forest use. Permanent economic areas (PEA) should be organized along the boundaries of soil sites with fixing the boundaries of PEA in the forest and indicating them on the planning and cartographic materials of the forest planning. PEA is a territorial activity unit established for carrying out a complex of forest planning activities with the aim of forming plantations with prevalence of perspective (target) tree species that is most suitable for these soil and soil conditions of the site of occurrence. Within the permanent economic site, selective methods of forest inventory, GPS-measurements, materials of space survey of forests are used. The peculiarity of forest design on a soil-typological basis is the design of a system of measures aimed at preserving and restoring indigenous forest types that ensure the sustainability of

forest biogeocenoses, high productivity, and the greatest ecological and economic effect of forest growing. The design of logging and reforestation is carried out for each permanent economic site with the formation of future designated forests. The zonal method of forest planning will solve practical problems: increase in the size of taxation sub-compartments by 1.5 times; increase in the accuracy of forest taxation, target forest growth, optimization of the species and age structure of forests, an increase in the share of coniferous forests by 10%, the proportion of young growths by 10-20%, a decrease in the proportion of middle-aged plantations - by 20%, the share of ripe coniferous stands by 5% the average reserve of growing stock - by 10%, the total forest productivity - by 10%, the annual increase in forestry income by 200 billion rubles (in the prices of 2012). (13). In Belarus, attempts have already been made to introduce the zonal method at the end of the last century, but without much success. Today, in conditions of increasing the intensity of forest use, involving all possible forest resources in the economic circulation, obtaining maximum yield from forestry, it seems expedient to apply the zonal method of forest planning. To do this, it is necessary to conduct appropriate scientific research, develop a methodology for its conduct, and prepare proposals for a regulatory framework.

Depending on the economic and biological value and the required accuracy of forest taxation, the following methods of taxation and forest inventory technology are used.

Methods of forest taxation:

- approximate;
- selective-measuring or selective-enumerative;
- enumerative.

Inventory technologies:

- cameral analytical and measuring interpretation of aerospace survey materials;
- actualization of growing stock taxation indicators on personal computers using software on mathematical models.

The conducted survey shows that there is no common opinion regarding the application of different methods of taxation in the forestry enterprises: individual forestry enterprises favor more precise methods (enumerative, selective-measuring), others - for the least accurate - the approximate. In fact, and this is also confirmed by many forestry enterprises participating in the study, the use of only one of the taxation methods can not be optimal from the point of view of price-quality. Why conduct convolutional measurements in those forests that will not be involved in economic activities in the nearest audit period, why spend money on this? The experience of developed countries shows that in forests in which there is no economic activity, forest planning (in its classical sense) is not carried out at all, and the assessment of forest resources in this territory is

calculated by the statistical method. Therefore, in the conditions of Belarus, the most appropriate is the application of different methods of taxation in a complex in the proportions in which the maximum economic effect is traced, depending on the value of the forest of sustainable forest planning and forest management:

aviation - taxation is carried out based on materials obtained from unmanned aerial vehicles. This method is expedient to tax plantations damaged as a result of natural calamities, fires, mass plant diseases and other similar phenomena with the purpose of unplanned adjustment of forest planning projects or assessment of damage to the forest;

deciphering - the taxation is carried out by stereoscopic interpretation of contours of sub-compartments and basic taxation indicators (bogs, nature protection forests, specially protected natural areas, forest fund contaminated with radionuclides, other territories by decision of the Ministry of Forestry). A possible software module for this method is Photomod Stereo Measure;

approximate - full-scale taxation, visual determination of the taxation characteristics of plantations. This method is advisable to use in plantation taxation in which forest planning measures and forest use are not projected;

selective-measuring or selective-enumerative - full-scale taxation, visual determination of taxation characteristics with the laying of circular relascope platforms or sites of constant radius. This method is advisable to use in the areas designed for all types of cuttings;

actualization of taxation indicators - table-top actualization of available data. This method is advisable to apply for the development of the forest management plan, the term of validity for which has not expired, for example, in cases of reorganization of the forestry enterprises.

If everything is perfectly clear with the approximate, selective-measuring or selective-enumerative methods, they are successfully used in the Republic of Belarus, then for effective practical application of the deciphering method it is necessary to decide which pictures to use, what programs to use for processing materials, which forests to tax using this method.

A few years ago it was believed that the use of the deciphering method or other similar remote forest inventory methods (without full-scale survey) is typical for countries with large areas of forests, but today such methods not only justify themselves economically, but also show the accuracy sufficient for the purpose economic activities and full-fledged forest planning.

To assess the accuracy of the taxation interpretation, the following increments are used: the species composition coefficient of the growing stock is decoded to an accuracy of ± 1.5 units; age over 100 years - ± 2 grades of age, up to 100 years - ± 1 grade of age; relative completeness ± 0.15 units of completeness.

Taxation deciphering is practically based on an approximate assessment of the plantation taxation parameters. When decoding the species composition of the growing stock, the color and shape of the crown are taken into account, the structure of the canopy, the average height of the tree species is determined by the difference of the longitudinal parallaxes and controlled by measurement, and the relative completeness by the eye-stereoscopic method in the density of standing of the trees, the closeness of the canopy of the stand, and its depth. Since the average diameter of the growing stock during the decoding of photographs is almost impossible to measure, it is determined on the basis of correlation equations for the relationship between height, volume, crown diameter and canopy closeness.

With the help of correlation dependencies, the growing stock on a hectare is also determined. If the taxation descriptions and cartographic material of the previous forest inventory have been preserved, they are used for contour and taxation decoding of photographs.

With full-scale forest inventory, the boundaries of the sub-compartments and the characteristics of plantation parameters may not coincide with those previously obtained during the interpretation of photographs. This is permissible, since the final definition of boundaries and the taxation characteristic of the stand plantations are determined by the tax collector naturally or in another case at fixed boundaries of sub-compartments that can be transferred from the cartographic forest inventory materials to the interpretation materials. (14).

If we consider the cost analysis of the deciphering method of taxation, it is expedient to divide all expenses into four parts:

- wages for the contractors;
- cost of equipment;
- cost of material and cost of aerial photographs;
- resolution of images for interpretation.

Such an analysis was conducted in 2013 in Croatia for a fragment of uneven-aged forest located within a private forest estate with a total area of 480 hectares. The main species of trees growing on this territory were: Stalkless flowered oak (*Quercus petraea*), European beech (*Fagus sylvatica*), European hornbeam (*Carpinus betulus*), European alder (*Alnus glutinosa*), cottonwood (*Populus sp.*). Comparison of the results obtained with the help of classical ground-based taxation and taxation by the method of interpretation was performed. The cost of applying these methods was also compared. The allocation of stratum boundaries by the method of decyphering was carried out on the basis of the analysis of stereomodels constructed from stereo pairs of color infrared digital images with a spatial resolution of 30 cm and 10 cm in the free software PHOTOMOD Lite. Prior to the allocation of the boundaries of the strata, categories of plantation classification were

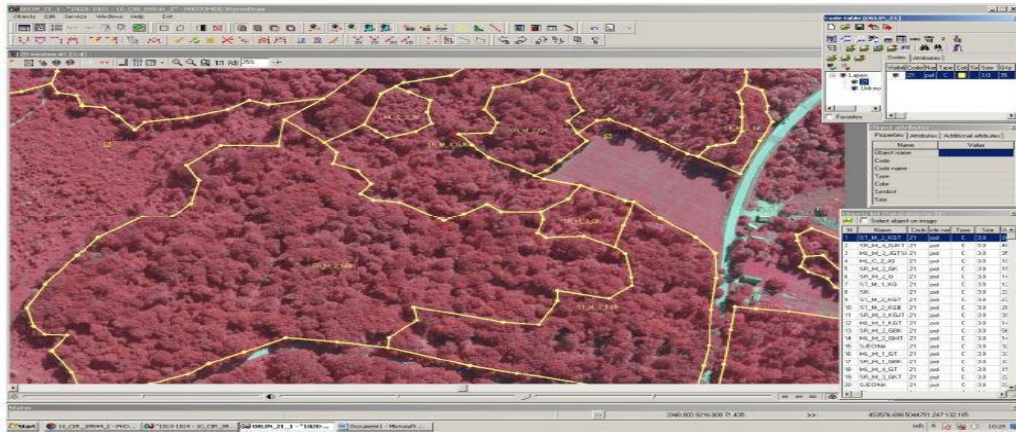
defined, four main categories and 19 subcategories of forest and forest land classification used in deciphering digital aerial photographs were identified (Table 5).

Table 5. Classification of forests and areas designated for forest growing, used in deciphering digital aerial photographs

Category	Subcategory
Coverage	High Forest - Young High forest - Middle-aged High forest - Old Cutting forest Shrubs Areas of succession Land, not covered with forest
Composition	Clear Mixed Irrelevant
Crown density	91-100% 76-90% 50-75% 50% Irrelevant
Prevailing tree species	Stalkless flowered oak (<i>Quercus petraea</i>) European beech (<i>Fagus sylvatica</i>) European hornbeam (<i>Carpinus betulus</i>) European alder (<i>Alnus glutinosa</i>) Cottonwood (<i>Populus sp.</i>) Other Irrelevant

The strata in the interpretation of digital images were distinguished on the basis of visual differences between classification categories: crown size and tree heights ("cover" category), composition, crown density and prevailing species (Figure 12).

Figure 13. The allocation of strata in the deciphering of digital images



95 landings were allocated through land taxation, which formed 6 economic sections or 24 sub-compartments, grouped into 6 quarters. As a result of the interpretation of digital aerial photographs with a resolution of 30 cm, 410 strata were identified, which formed 27 sub-compartments. When deciphering photographs with a resolution of 10 cm, 645 strata were formed, forming 29 sub-compartments. As for the land taxation, and when deciphering the images, 6 economic sections and 6 quarters were allocated. The investigated territory, in addition to forests and territories designated for forest growing, includes private farm households, arable land, meadows and other areas that are not covered by forest. Thus, the area covered by forest occupies only 288.89 hectares from the original 480 hectares. To determine the discrepancies, 3 statistical tests were conducted:

comparison between the sub-compartments obtained during the land taxation and those obtained by deciphering the photographs at a resolution of 30 cm;

comparison between the sub-compartments obtained during the land taxation and the parts obtained by deciphering the photographs with a resolution of 10 cm;

comparison between the sub-compartments obtained by deciphering the photographs at a resolution of 30 cm and 10 cm.

All tests showed little statistical discrepancy. The test results indicate the possibility of using the method of deciphering digital aerial photographs in the process of forest taxation. Moreover, the use of pictures with a resolution of 30 cm, and especially with a resolution of 10 cm, allows very detailed interpretation, as evidenced by the number of allocated strata and the average stratum area ($S_{GSD\ 30\ cm} = 0.7$ hectares, $S_{GSD\ 10\ cm} = 0.45$ hectares). In other words, from pictures with a resolution of 30 and 10 cm, it is possible to clearly discern forest plantations and tree species and to carry out deciphering with a high degree of accuracy and reliability. For comparison: the average area of 95 polygons allocated by the land taxation method is 3.04 hectares.

A comparison of the cost of taxation work carried out by various methods is shown in Table 6.

Table 6. Comparison of the cost of taxation work carried out by various methods

Expenditures	Cost	Unit	Euro/u nit	Paid units	Cost		
					Land mapping, Euro	Decipheri ng. 30 cm Euro	Decipheri ng. 10 cm Euro
Aerial photography	The larger-scale (10 cm) The lower-scale (10 cm)	ha ha	6,98 1,40	480 480		670,42	3 352,60
Wages	Forestry Engineer Technician Wages for field works	day day day	54,57 28,85 22,62	T=12+3 F 10=6+1 F 30=5+1* T=12 T=6	818,59 346,15 271,40	382,01 28,85 22,62	436,58 28,85 22,62
Equipment	GPS Compass Computer ArcGIS DPS PHOTOMOD + software	Piece Piece Piece Piece Piece	358,1 97,78 532,16 2869,6 1 3126,4 3	1 1 1 1 1	358,14 97,78 532,16 2869,61	2869,61 3126,43	2869,61 3,126,43
Material expenditures	DTK 25 Digital orthophoto b/w Digital orthophoto colour Car	Sheet Shhet Sheet Km	39,91 26,61 39,91 0,27	1 2 1 T=960 F 10=80 F 30=80	39,91 53,22 9,91 255,44	39,91 21,29	39,91 21,29
Total (euro)					5682,31	7161,23	9897,88
Average (euro/hectare)					19,67	24,79	34,26

Financial analysis shows that the most profitable from a financial point of view is a taxation based on field work: the average cost for 1 hectare is 19.67 Euro. Compared with the land taxation, the method of deciphering is more expensive. The cost of deciphering images at a resolution of 30 cm is 24.79 Euro/ha (26.03% higher), and the cost of deciphering images at a resolution of 10 cm is 34.26 Euro/ha (74.19% higher).

Since the purchased equipment can be used in the future and, ultimately, will pay off, the comparison of the cost of taxation by different methods was also performed without taking into account the initial costs for the equipment. In this case, the most profitable method is the decoding of images with a resolution of 30 cm (the average cost of works is 4.03 Euro/ha). The cost of land works is higher than this indicator by 56.59% and is 6.32 Euro/ha. Also, as in the previous case, the

method of decoding photos with a resolution of 10 cm is the least profitable (the cost of works is higher by 234.87% compared to the cost of deciphering with 30 cm resolution and 113.84% higher than the cost of land taxation).

The calculations show that the least profitable in both cases is the method of deciphering the images with a resolution of 10 cm. Consequently, it can be concluded that the deciphering of the images at a resolution of 30 cm gives approximately the same results in accuracy as when using pictures with resolution 10 cm, but it is much cheaper. For this reason, in future, with economic comparisons and when compared with the method of land taxation of plantations, we took into account only the method of deciphering the images with a resolution of 30 cm.

For further analysis of the cost of works and discussion of the results, the concept of "aerial photographic coefficient" was introduced: the ratio of the area under study (480 ha) to the area occupied by the forest (288.89 ha). In our case, this coefficient is 1.66. Thus, due to the uneven coverage of the forest in the study area, it was necessary to shoot 66% more so that all the forest under study was displayed in the pictures.

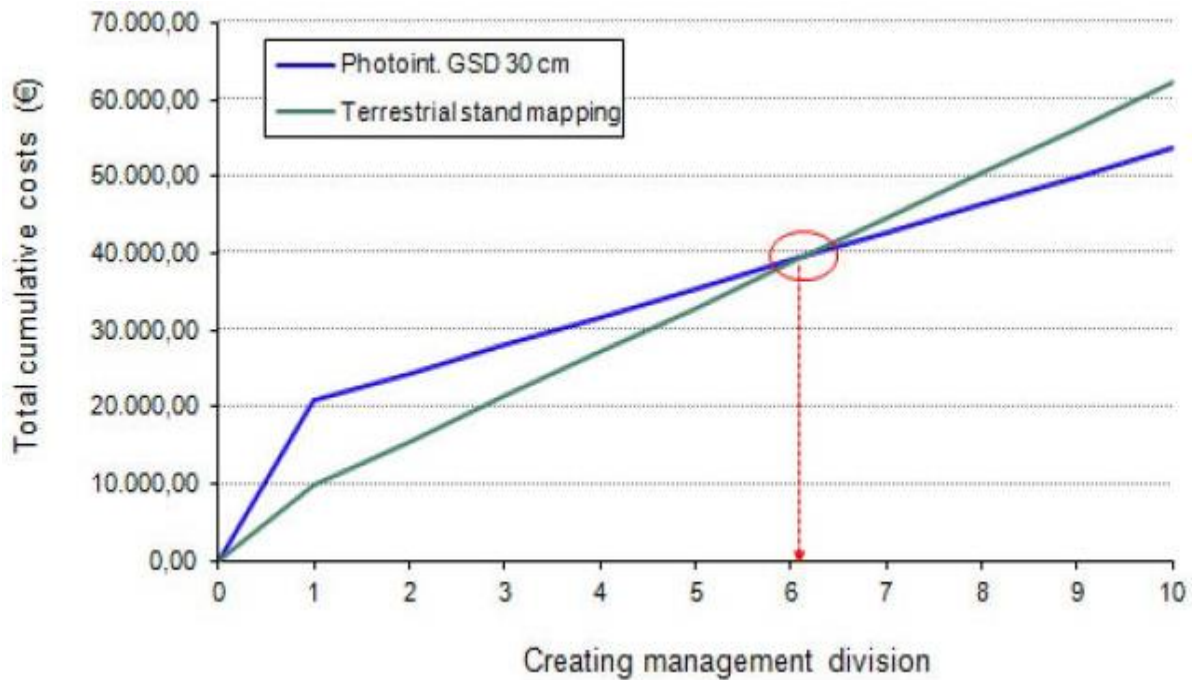
As shown above, interpretation of aerial photographs with a resolution of 30 cm from an economic point of view is more justified than carrying out land operations, when the initial costs are not taken into account. It was necessary to find out at what stage primary costs will be paid back using the decryption method.

The initial costs, including the purchase of a digital photogrammetric station (PHOTOMOD Lite software used in this study was free of charge) can be repaid already with the first application, if the area is 950 hectares (at $k = 1.66$).

In the case of purchasing a commercial version of PHOTOMOD, the costs will be repaid at the time of the seventh taxation of 950 hectares (at $k = 1.66$). The total cost of carrying out seven forest taxation projects using land mapping is 44662.16 Euros, and the cost of deciphering images at a resolution of 30 cm for a similar purpose is 42691.73 Euros.

With each subsequent project, the benefit of using the deciphering method increases (Figure 13).

Figure 14 The point of return of the deciphering method depending on the amount of work in comparison with the land-based method of taxation



If the study territory has a bigger area, the initial costs will pay off even faster. For example, if the area is 1300 hectares, the purchase of PHOTOMOD will pay off when carrying out the fifth forest taxation project by the deciphering method.

Table 13 shows that the cost of aerial photography is an essential part of the total costs when using the deciphering method.

One of the important advantages of the deciphering method is that after the vectorization in StereoDraw, most of the work can be considered completed. The remaining work is to perform a small correction of the boundaries of the allocated strata using ArcGIS (or other software for working with spatial data) and to merge the allocated strata into potential sub-compartments. In case of taxation by a classical land-based method, after carrying out full-scale field work, it is necessary to perform vectorization and to compare the selected areas with attributive data.

In addition, the images and the strata allocated by them are always available for viewing, so the work performed can be repeatedly verified. Images can be used in the future to perform measurements of the main indicators of the growing stock with photogrammetric methods, which reduce the cost of subsequent work.

As a result, we can conclude that the deciphering of the images with a resolution of 30 cm gives approximately the same results in accuracy as when using images with a resolution of 10 cm, but it is much cheaper. (15).

The purely deciphering method of taxation based on aerial photographs without measurements on the ground can not be applied in the zone of intensive forest exploitation and

forest planning, since it does not meet all the requirements currently required for forest planning. The main disadvantages of the deciphering method are:

- the implementation of aerial photography (AP) is strictly related to weather conditions, which often does not allow shooting in the planned time. This is the reason for increasing the duration of the full cycle of forest planning operations to three years;

- the interpretation of the AP does not allow to take into account and describe the part of the stand hidden beneath the main canopy, especially in the plantations with the second tier;

- the growing stock is not deciphered in the early phase of colonization of insect pests, which leads to delay with measures to fight pests of the forest, and, ultimately, to continuous sanitary cutting;

- the signs of damage by the phyto pests are also not timely determined, and it is possible to distinguish between them on the AP only at the last stage - the shrinking of the growing stock;

- absolutely insuperable drawback of the interpretation of remote sensing materials as a whole is the impossibility to determine the exact (up to 5-10 years) age of the growing stock when moving from ripening to ripe and middle-aged to ripening at the taxation of the operational fund i.e. determination of the size and location of the operational fund in the space. Accurate taxation of this sign of the growing stock determines the size of forest exploitation and thus is an economically decisive element of the valuation of economic forests;

- it is impossible to determine the number and species composition of the undergrowth, which does not allow the appointment of an economic order for the conservation of undergrowth in cutting for the main use;

- the state of amelioration facilities is not determined;

- it is difficult to determine the allocation of specially protected forest areas or their analogues - biotopes, according to the new Forestry Code, one of the important elements necessary for the forestry enterprises to undergo the forest certification procedure;

- when decoding any kind of remote sensing it is impossible to correctly determine the state of forest cultures and young growth, including their transferring to forest-covered lands;

- when decoding remote sensing materials, overgrown quarterly glades are not "readable", which makes it impossible to get rid of the distortions of the location of the quarterly network on the topographic basis that were allowed by the previous forest planning;

- there is no direct contact between the forest manager and the customer, which will inevitably affect the overall quality of the whole set of works on forest planning (17).

In addition to the deciphering method of taxation, the cheapest method of updating the taxation characteristics of plantations is also in demand today in the market. The condition for

realizing the actualization of taxation indicators is the availability of a taxation and cartographic base and software processing facilities.

Methodical approaches to actualization of taxation indicators have been actively studied in scientific circles of the forestry sector of the Russian Federation - however, the available methods are mainly of a scientific nature, complex formulas are used, and they are difficult to apply in practice.

For forest planning in Belarus, an algorithm based on tabular and normative materials used for taxation can be used to develop the most appropriate update methodology. Inputs to the increment tables should be taxation indicators, which change with time and are reliably determined, such as species, class of productivity, age. The methodology should provide for the allocation of problem areas of the forest or individual taxation elements, which for some reason can not be updated (composition for the transition of species, marketability, management measures) for making expert decisions.

Conclusions and recommendations: the above analysis shows that in Belarus, in addition to the current method of forest inventory of age classes, it is advisable to consider the possibility of introducing a forest planning method in forest areas with a high intensity of forest planning with a view to more efficient forest planning.

In Belarus, it is necessary to begin the implementation of the local forest inventory method on an experimental basis, and the following steps should be observed:

1. Organization of permanent economic areas (PEA) as a set of taxation sub-compartments (or a separate sub-compartment), territorially united by the generality of the conditions of the site of occurrence, targeted forestry and forest planning;
2. Permanent economic areas (PEA) should be designated on the planning and mapping materials of the forest planning;
3. When designing forest planning activities, the PEA will be a territorial unit established for the design and implementation of a set of forest planning measures to form plantations with a predominantly promising (target) tree species that is most suitable for these soil and soil conditions of the site.

The zonal method of forest planning can be applied where there is a need and a practical possibility of an individual approach to the implementation of design and realization of forestry and other activities for each established permanent economic area. To implement the district method, it is necessary to make appropriate adjustments to the legal framework.

In the future, this will solve practical problems: stabilize the sub-compartment structure of the forest fund, increase the size of taxation sub-compartments by 1.5 times; increase the accuracy

of forest taxation, ensure targeted forest growth, optimize the species and age structure of forests, increase the share of coniferous forests by 10%, the share of young growths - by 10-20%, increase the annual income of forestry according to the calculations by Atroshchenko O.A. on 20 million US dollars.

From the taxation methods, the most promising and economically effective for development is the deciphering method for determining the basic taxation indicators in bogs, on the territory of nature protection forests, specially protected natural areas, in forests contaminated with radionuclides and other areas with low intensity of economic activity, and also combining it with other methods in the same area. Equally interesting and cost-effective is the use of the aviation method for assessing forests in areas damaged by natural factors.

However, paying tribute to the remote methods of forest inventory prior to their application, in order to prevent the replacement of full-scale taxation by the deciphering method, it is necessary to clearly define and write down in the regulatory framework, taking into account the proposals mentioned above, which forest areas can be deciphered and which require mandatory application of the most precise contact methods - eye-measuring taxation, or, as, for example, in scientific research - only measuring taxation (continuous counting). To the territories of the forest fund, where an eye-measuring taxation is required in combination with the interpretation of aero or space imagery, the whole zone of intensive forest planning should be included.

The most effective (in terms of quality of determination of taxation characteristics) is measuring interpretation in 3D format, based on measurement of tree heights by the difference of longitudinal parallaxes of the stereo model of a pair of aerial photographs. Now, with the rapid development of IT technologies, it is possible to develop a software package that allows you to measure the height of a tree canopy, but the main thing here is to attract high-class specialists with high-quality stereoscopic vision.

What concerns the method of actualization, its application is possible with the aim of saving budgetary funds in the conduct of early forest planning, for example, in the case of the division of the forestry enterprise territory, the formation of new forestry institutions, the updating of forest planning materials in forests with no economic activities - i.e. when it is required by legislation to carry out forest planning, to develop a new forest planning project, but this will not entail any changes in the forestry process. However, the application of this method requires the development of a methodology on a scientific basis.

To ensure the operation of the proposed forest planning technologies, to increase the accuracy of forest taxation surveys, to measure taxation indicators of growing stock, it is recommended to use modern high-precision inventory instruments, tools, programs that have proved themselves in the forest planning in developed European countries:

1. **Tablet for field use Getac T800-Ex** is protected by IP65 and MIL STD 810G standards, that is, it can be dropped from a height of 2 meters and exposed to vibrations and shocks. It will survive the temperature from -21 to 50 degrees and lets inside neither water nor dust. The tablet includes a powerful 4-core processor from Intel, 8.1-inch screen, support of LTE cellular networks.

Figure 15. Tablet for field use Getac T800-Ex



Specifications:

Screen 8.1 inches, 1280x800 pixels;

CPU Intel Celeron N3530 with a frequency of up to 2.58 GHz;

Google Android or Windows 10;

64 or 128 GB SSD, 4 GB of RAM;

GPS-receiver, LTE module ;

Modules: Wi-Fi 802.11ac and Bluetooth 4.0;

Battery for 8 hours of operation, additional battery for another 8 hours;

Dimensions: 227x151x24 millimeters; weight 915 grams.

The cost of the tablet is from 2.5 thousand US dollars.

The use of the tablet is of interest in carrying out field forest planning operations with the introduction of taxation data into the electronic taxation card and making adjustments to the cartographic basis on the site in the field.

2. Laser ranging device Nikon Forestry 550 - provides measurement of distances in the forest and determination of the height of trees - mandatory elements of forest photography and forest taxation.

Figure 16. Laser ranging device Nikon Forestry 550



Ranging device is designed for measuring distances, heights, horizontal locations, the distance between two vertically arranged points and vertical angles. The device is equipped with a high-quality optical system - a monocular construction is used to aim at a measurement object with a 6x optical zoom. The lenses of the ranging device optical system have a special coating and provide excellent conditions for sighting in the forest through the viewfinder. The measurement results and additional service information are put on the internal and external liquid crystal (LCD) screens of the ranging device, while all the information on the external screen is displayed simultaneously. The Forestry 550 ranging device is equipped with a pulsed laser emitter that operates in an invisible frequency range, thus ensuring relative safety of the instrument. The ranging device is controlled by only two buttons.

To measure the height in the forest, you must point the ranging device at the top of the tree, press and hold the Power button. The distance to the top of the tree will be displayed. When the Power button is released, the reading will be fixed. Pressing the Mode button displays the horizontal distance to the tree - the distance and the basic distance. Pressing the Mode button again displays the value of the tree height in relation to the horizontal level of the ranging device - the basis. To obtain the height of the tree, it is necessary to add the height of the sight to the H-value, as is done

with a conventional pendulum altimeter. This method of measuring tree heights can only be used if the tree base and the observer are on the same line or level. This method of measurement refers to measuring the height of one point.

Specifications:

the maximum distance - 500 m;

the minimum distance - 10 m;

the measurement error is ± 0.5 m at a distance of up to 10 m, ± 1 m at a distance of more than 100 m;

LCD display;

lens 21 mm;

6-fold zoom;

field of view - 6 degrees;

adjustment of the eyepiece focus ± 4 diop;

dimensions 130 mm x 69 mm x 45 mm;

weight 210 g;

3 Volt battery, type CR2;

operating temperature range $-10^{\circ}\text{C} \dots +50^{\circ}\text{C}$.

The cost of the ranging device is from 500 USD.

For taxation in Belarus, the ranging device is of interest in measuring tree heights, laying trial areas, measuring lines.

3. Dendroscope is a program for carrying out relascopic measurements in growing stocks with a phone or a tablet with a built-in camera. The integrated functions of the program allow determining the growing stock and the intensity of cuttings. The program works on devices that the user can always have at hand - i.e. a mobile phone or a tablet. Being in the growing stock, it is enough to point the camera towards the individual trees and make sure that the tree fits in the frame. When the counting of trees is over, the program can measure the height of all the species, you only need to point the machine to the base and top of the tree.

Figure 17. Dendroscope program in mobile phone



The program serves to measure the sum of areas of cross sections, and as a result of the stock by the method of Bitterlich. During the measurement, individual observations are recorded via the code in memory, and then after the introduction of altitude data, which can be recorded or measured using a telephone, the program automatically calculates the stock by species. Measurement can be performed on a given surface without recording the results (rapid measurement) or make several measurements on one selected area. In the second case, the data of individual measurements are recorded in memory, and at the end the program calculates the average values for the entire selected area.

It is also possible to display a detailed taxation description of the growing stock, created on the basis of the performed measurement. The description contains such elements as: species composition, stock, height, and after the introduction of information about age, also the course of growth and productivity of species.

After transferring the program to the "Intensity of operation" mode and after carrying out several measurements on the relascopic areas, the user receives information on the mass of each species in the growing stock, the mass that can be obtained (in percent or m^3) - the mass can be displayed in the gross value (with bark) or net (without bark).

The cost of such a program is subject to negotiations with the software manufacturer and depends on the number of kits supplied.

For the conditions of Belarus, the program is interesting in the conduct of forest planning by selective-measuring method.

4. Computer caliper gauge Haglof Digitech Professional - the pocket PC Digitech Professional communicates with external devices, such as GPS and a bar code scanner by using wireless Bluetooth connection. The built-in infrared receiver provides a direct link to the Vertex III and Vertex Laser VL400 for entering altitude data. With the help of the sequential port Digitech Professional it has the communication option. The pole caliper Digitech Professional Caliper can be folded, which greatly simplifies transport and storage in confined spaces.

Figure 18. Computer caliper gauge Haglof Digitech Professional, produced in Sweden



Specifications:

32MB flash memory of the file system. Permanent memory with high reliability. 2Mb high-speed RAM;

processor: 32-bit processor with low power consumption;

display: graphic monochrome, graphical interface 128x64 pixels;

measuring range 500 mm; 650 mm; 800 mm; 950 mm; 1020 mm;

accuracy ± 1 mm;

weight 1 kg;

working time 200 hours without recharging;

data transfer - the collected data can be transferred to a PC;

communication port: serial port RS 232C;

operating temperature from - 20 to + 60 degrees;

power supply - rechargeable NiHm battery.

The cost of the caliper gauge is about 2800 US dollars

In the conditions of Belarus, it is of interest for the forest taxation by enumeration, withdrawal of timber cutting areas.

5. Set for forest taxation Masser Sonar. The Postex Laser uses ultrasonic and laser technology to easily and accurately measure the height of individual trees, it is convenient, a robust housing is combined with intelligent content and enhanced functionality.

The Postex device and the DigitechR Professional caliper with Postax software ensure accurate and efficient plotting of individual trees or other objects on the plot plan. Distances are transmitted via BluetoothR or via an infrared channel to the Digitech terminal, where data is recorded along with other detailed information about tree species, diameter, height, etc. For the correct determination of the center of each tree, the diameter of a particular tree is taken into account. The method is optimal for permanent trial areas, for example, in the inventory of forests on permanent test areas, and in those cases where it is important to re-examine the desired tree in the plot. With the help of ultrasound, the location is determined exactly when sighting on the object is difficult due to bushes and branches.

Figure 19. Set for forest taxation Masser Sonar



Technical specifications of Postex Haglof6

dimensions: 95 x 70 x 58 mm;

weight: 260 g (including battery);

battery: 1 x CR2 lithium 3V;

temperature: min. -15°, max. 45°C;

height: min. 0, max. 999 m/yard, resolution 0.1 m;

angles: -55° to 85 degrees. / -60° to 94° resolution: 0.1°;

wireless interface: Bluetooth 1.x or infrared;

Transponder:

size: diameter 70 mm per transponder;

weight: 85 g (including battery) per transponder;

battery: 1.5 V alkaline, type AA per transponder;

power consumption: max. 9 mW

The cost of the kit is from 4 thousand US dollars.

For the conditions of Belarus, the complex can be used for laying trial areas, forests monitoring

Conclusions and recommendations: all the devices considered are high-precision, high-performance measuring instruments of the world's leading brands, which have been widely recognized and disseminated in the practical activities of developed European countries in forest planning and forestry. This equipment provides electronic collection, processing and storage of forest planning information on electronic media, and is the basis for creating mapping materials. Undoubtedly today the cost of world-class equipment is quite high, but unlike the usual analogues

of these devices (a tablet computer costing \$ 400, a caliper of Swedish production costing about \$ 100, a Suunto PM-5/1520 altimeter of Swedish production costing \$ 140 (USA), a Swedish Haglof chain-type angle gauge (relascope), costing \$ 25, a Haglof Walktax threadlike distance gauge of Swedish production, costing \$ 190) in countries where new forest planning technologies have already been developed and implemented in production, modern equipment pays in full and first of all due to automation of the production process.

The proposed devices provide high accuracy and performance during measurement. For example, when using an electronic caliper, ranging device, when laying a trial area, or during withdrawal of timber cutting areas, only one worker is enough at the plot (the trees are counted by one person with automatic entry of data into an electronic log, the measurement of the lengths of the sides of the withdrawn area is also possible by one person) primary data processing is no longer made from a paper medium, but is read from a memory card of the equipment, processing is also carried out electronically. The remaining devices, for example, the tablet is equipped with a microphone and Bluetooth system, which allow accumulating taxation characteristics in the day database, reproduced in voice mode or scan data directly from the measuring devices via Bluetooth wireless communication. This gives the tax collector an advantage in carrying out taxation in a more operative mode.

Thus, the high cost of equipment reduces the costs of measuring operations, processing and verification of primary taxation data and, with the large-scale implementation of such tools, will require changes in the rationing of many types of work, which will require additional research. Undoubtedly, such expensive equipment can not be introduced into production at the same time (the cost will increase several times), for example, providing 100 taxators, which constitute an annual demand for Belarus, with tablets only will require a one-time payment of at least \$ 250000. But it does not need to be done. The process of implementing new equipment should go step by step with the introduction of new technologies, training the staff to work with new tools, smoothly redeploying to new directions of those staff units that will be gradually released by automating processes.

3. Study of the positive and negative aspects of the functioning of the market for forest planning services (by the example of individual countries), including the preparation of a review of the positive and negative aspects of the functioning of the market for forest planning services (on the example of the above mentioned countries)

Summary: In this section, an example of selected European countries provides an overview of possible models for the functioning of the forest planning market - from a centralized to a clean market. Positive aspects of the competitive environment in the market are considered, as well as possible negative consequences of the formation of market conditions. To minimize the negative effects of market mechanisms of forest planning, recommendations are proposed for the conditions of the Republic of Belarus, which should be taken into account when making decisions.

Features of the market functioning of forest planning services in different countries are expedient to be considered by analogy with the accepted in the economic theory and well-known models of the market - monopoly, oligopoly and monopolistic competition, perfect competition.

At present, depending on the specific features of the development of market mechanisms of the economy, a market for forest planning services has been formed in different countries. As a rule, for the CIS countries with insufficiently developed elements of a market economy, the state monopolization of the forest planning market is characteristic (Belarus, Ukraine), in countries with a high level of development of market institutions - perfect competition in the market of forest planning, which stipulates involvement not only private organizations, but also private individual entrepreneurs in this area of activity.

The most typical example of the preservation of a state's monopoly on the provision of forest planning services is the Republic of Belarus, Ukraine, and the models of perfect competition - Estonia, Finland, Poland, for example in forestry in Finland, forest planning works involving private individual entrepreneurs are allowed. The intermediate stage in the formation of a competitive environment is the market for forest planning services in the Russian Federation, which can be attributed, respectively, to monopolistic competition due to the fact that access to the forest planning market has certain restrictions according to the current legislation in the country.

These countries most clearly characterize the features of the functioning of the market for forest planning services, with the example of which one can consider the positive and negative aspects of the organization of forest planning.

Belarus, Ukraine:

Forest planning in the system of state forest planning of the Republic of Belarus takes a key role and functions with a full state monopoly on this type of work. In accordance with the Forestry

Code and the decision of the Government of the Republic of Belarus, a complex of forest planning works can be carried out by one state forest planning organization - RUE "Belgosles", in which 4 forest planning expeditions are allocated: two expeditions located in Gomel and Vitebsk regions - separate subsidiaries of RUE "Belgosles" and two Minsk expeditions are in fact structural subdivisions of the central enterprise. Forest planning works are carried out at the expense of full budget financing, which is distributed by the head enterprise for forest planning expeditions, depending on the required volumes of forestry works.

In Ukraine the state-controlled centralization of forest planning is also preserved. In accordance with Article 47 "Forest planning" of the Forestry Code of Ukraine, forest planning is mandatory throughout the territory of Ukraine and is maintained by the state forest planning organizations under a single system in accordance with the procedure established by the central executive authority that ensures the formation of a state policy in the field of forestry. In forests that are in state ownership, forest planning is carried out at the expense of the state budget, in the forests of communal property - the local budget, in the forests of private property - for the funds of their owners (18).

Conclusion: the centralized model of forest planning in Belarus and Ukraine is inherited from Soviet times and has not undergone any significant changes during the years of economic transformation, the lack of a competitive environment does not in any way stimulate state enterprises to develop competitive advantages, improve quality, introduce modern technology, software, more economically effective technologies, expanding the range of services, as a result - reducing the cost of work in the struggle for the market. A high component of administrative and managerial functions in the structure of the cost of work will not allow to compose a worthy cost competition to a compact private enterprise with a staff of 15-20 tax collectors in which the administration functions may well be performed by a director and an accountant.

Finland, Estonia, Poland:

The peculiarity of the market of forest planning in Finland is that it is integrated into the general market of forestry services rendered by different forestry consulting structures to forest owners. The forestry and forestry services market in Finland has already passed the main stage of its development. Forest owners carry out about half of the main planning and management of forestry on their own. However, certain types of work, such as forest planning, planning of forest planning activities require special skills, therefore some work is bought for their implementation in the optimal time. Expert assistance is used to compile many official notices and contracts. The services needed by forest owners are purchased from local forestry associations and enterprises that serve the

forestry. The structures that provide different types of services to forest owners can be divided into state and private ones. Consultations in the private sector, its support and basic improvement are the responsibility of government service organizations. Forest planning in private forests is mainly the responsibility of forest centers, although similar activities are available from other organizations. In recent years, 7-8 million euros have been allocated for consulting, training and notifying forest owners. Activities are coordinated mainly by forest centers. Forestry associations use tax-related membership fees to advise, educate and notify forest owners.

In administrative provinces, consulting forest owners is also performed with the money allocated by the European Union. Forest industry concerns, banks and entrepreneurs serving forestry also provide consultancy services to forest owners as part of their commercial activities. Private entrepreneurs serving the forestry offer forest owners the same types of services as forestry associations. Also, enterprises that buy wood raw materials expand their sphere of activity to a certain extent and offer to provide a certain list of forestry and forest planning services to forest owners.

Forestry associations in Finland, along with the main task of protecting the rights of forest owners, unite forest owners in order to increase profitability and carry out side-tasks of their management, in order to achieve economic, ecological and social sustainability of forestry and forest planning. To achieve these goals, the forestry associations have the right to collect forestry fees, according to the law. The official in charge of paying taxes on the basis of real forestry lands sets the amount of the contribution of each forest owner, accepts payments and reports for them. The activities of silvicultural associations are regulated by law and decree.

More than half of the forest owners use the services of silvicultural associations directly. A significant part of the consultations for them is free of charge. Associations provide forest owners with services on almost all issues of forest planning, from forest planning design, forest management, tree cultivation and -up to marketing of received forest products and timber. Associations also provide information necessary for the compilation of mandatory notices and assessments of property status.

The share of silvicultural associations in compiling forest planning designs (forest planning projects) and their implementation is about 80%.

Forest centers are state organizations of the regional administration, working under the guidance of the Ministry of Agriculture and Forestry of the Republic of Finland. There are 13 forest centers in Finland. The activities of the centers are regulated by law, the procedure for work and financing are stipulated by law and decrees.

Forest centers appeal to develop sustainable forestry and are responsible for carrying out the control functions established by law. Accordingly, the activities of the centers are divided into support for forest planning and state control. The main areas of support for forest planning are: forest management, drainage reconstruction, forest road construction, training and counseling. The execution of supervisory functions is financed by the state.

The works on control over forest planning are separated into a separate structure. The main services and tasks of the control department are related to decisions on the allocation of subsidies under the Law on Financing Sustainable Forestry, verifying the execution of work on the forest management plan and compliance with the law. In parallel, the forest centers verify compliance with the legislation.

According to the law, forest centers need to submit notifications of planned cutting and reforestation activities. Workers of the Centers verify the data included in the notifications with the forest planning materials and available forest planning designs. On the basis of comparison, a decision is made on the expediency of checking the declared plots. Along with the functions of state control, forest centers are engaged in commercial activities, that is, they sell forest planning plans, draw up and implement plans for the reconstruction of drainage and the construction of forest roads. The activities of forest centers are justified by the fact that they contribute to the implementation of forest planning and, for the sake of preserving the conditions of competition, they must charge a market-determined fee for their services.

Individual entrepreneurs serving forestry - in the forest sector, this type of business is relatively new. Entrepreneurs offer forest owners the same services that forestry associations provide. Almost all entrepreneurs are engaged in cuttings. More than half of them are also engaged in planting forests, clearing plots, caring for young trees and removing timber from the plot. Approximately a quarter of entrepreneurs are engaged in drafting forest management plans.

A significant number of serving entrepreneurs act as contractors for large forestry concerns or forestry associations, and does not seek to contact directly with forest owners. Concerns in their turn seek to establish lasting contacts with forest owners on the basis of cooperation agreements with corresponding obligations. The largest concerns, offer forest owners - suppliers of raw materials, not only timber services, but also forest care services, other forestry, forest planning services. For example, the companies offer on a mutually beneficial basis for a fee to perform reforestation after commercial cuttings, make plans for forest planning. The forest owner gets the opportunity to draw up a forestry contract, which means to agree on the implementation of all major works on forest planning and organization of forest planning with the organization that buys wood.

Customers of wood raw materials provide clients (forest owners) with various consulting and expert help, and produce information material. (6).

The organization of the Estonian forest planning system has similar elements with the Finnish model. However, if in Finland legal entities conducting forest planning do not receive special licenses, then in Estonia it is necessary to confirm the relevant experience and the availability of technical means for performing forest planning operations. Forest inventory materials are mandatory for forest planning - forest restoration, intermediate cutting, commercial cutting. The requirements for the market of forest planning services are laid down in the Forestry Act of the Republic of Estonia dated June 7, 2006 (19). There are organizations of both public and private forms of ownership in the market of forest planning services in Estonia.

As a rule, in state forests, forest planning is carried out by specialists of the State Forest Planning Center, and in private forests by private forest planning companies. About 85 people are responsible for carrying out forest research and developing forest management plans in the State Forest Planning Center, up to 10 people in private structures are engaged in this work, which are included in the number of enterprises. In total, 18 private companies are engaged in forest planning in Estonia.

Forest planning is a licensed type of activity and, starting from May 2004, in order to conduct appropriate forest research and forest planning works both private and public organizations, must receive a license issued by the Department of Forestry of the Estonian Environment Agency of the Ministry of Environment. In total, currently 20 forest planning licenses have been issued to 18 private organizations, 1 to the State Forest planning Center, and 1 to the Estonian University of Living Sciences.

The license specifies that the enterprise has a corresponding set of technical facilities and trained specialists to carry out forest planning operations in accordance with the required technology (software, description of the work process).

Specialists who perform forest planning work (inventory of forests and development of forest management plans) must receive a forest planning certificate. To do this, you must pass a theoretical examination that contains 30 questions, 24 of which you must answer with the correct result, and also present practical skills of doing this work in 15 areas, in particular, it is necessary to correctly determine the height of the growing stock, its diameter, area, type of forest (location of plantation).

In total, there are 230 specialists in Estonia who possess forest planning certificates.

Forest owners in Estonia have a right to obtain support (not more than 14.5 euro per 1 hectare of forest) for forest research, forest inventory, development of forest management plans by private forest centers.

The system of forest planning services in Poland, as well as in Estonia, operates in conditions of free market competition. The obligation to conduct forest planning in Poland is assigned in the Forestry Act. Forest planning is carried out in the over forest district every 10 years. With relevant experience, knowledge of technologies and sufficient human resources, the organizations receive a license to perform forest planning works and competently perform a set of works on forest planning - they develop forest planning designs. A number of organizations have a license for forest inventory and forest planning projects: one is the State Forestry and Forestry Survey Bureau, and the rest are private companies. As a rule, private forest planning companies receive orders from private forest owners.

For the forests inventory, private forest owners are entitled to receive financial support from the budget for forest planning and forest inventory (less than 10 ha).

Recently, the share of private companies performing forest planning work due to competition in the market has significantly decreased.

Conclusion: the market of forest planning services in Finland, Estonia, Poland is formed and integrated into the overall system of market relations in forestry. The example of Finland in which private entrepreneurs are allowed to carry out forest planning shows that a market-based economic mechanism that has been established over the years can fully meet the forest owners' requirements for the quality of forest planning materials at acceptable market prices formed in a healthy competitive environment without any regulatory measures. The experience of Estonia and Poland, which do not provide any rigid administrative barriers and restrictions on market access for private entities, provide a mechanism for its justifiable effective regulation through the licensing of organizations and the certification (review) of specialists, in order to monitor compliance with established unified technology requirements, methods of forest planning and encouragement of increasing the level of professional training of employees performing taxation.

Such a practice for the purpose of strengthening the responsibility of forest planning organizations can be useful in the application of those countries that are just beginning to form the forest planning market or think about it, including that of the Republic of Belarus.

Russian Federation:

Let's consider separately the system of market relations in the forest planning of the Russian Federation.

Features of the organization of forest planning in Russia are laid down in the Forestry Code of the Russian Federation. The implementation of measures for forest planning is carried out by both federal executive bodies and their territorial subdivisions, as well as state authorities of the subjects of the Russian Federation and local self-government bodies.

According to Article 70 of the Forestry Code of the Russian Federation, the performance of work, the provision of forest planning services are carried out in accordance with civil law. That is, state authorities or local self-government bodies purchase works, services for forest planning in the manner established by the legislation of the Russian Federation on the contract system in the procurement of goods, works, and services to ensure state and municipal needs.

In accordance with civil law, the form of ownership of organizations (private, state, other) that provide forest planning services is not of fundamental importance.

Designing forest districts and forest parks, operational, protective, reserve forests, as well as specially protected areas of the forest are works and services that are carried out for federal needs. These types of work and services are carried out by the Federal Forestry Agency (Rosleskhoz) within the limits of the powers assigned. The territorial bodies of the Federal Forestry Agency in the federal districts and the territorial bodies of the Federal Forestry Agency for the subjects of the Russian Federation are authorized to implement provision of state services in the field of forest relations in forest districts and forest parks and the function of managing state property.

Other types of forest planning activities (for example, forest taxation) can be carried out both for the needs of the state authorities of the constituent entities of the Russian Federation and for the needs of local governments, forest users, necessary to exercise their powers granted under the Forestry Code.

Financing of forest planning activities is carried out from the corresponding budget of the budgetary system of the Russian Federation, extrabudgetary sources of financing, by individual forest users on forest areas transferred to them for lease or permanent (perpetual) use, depending on the type of forest use.

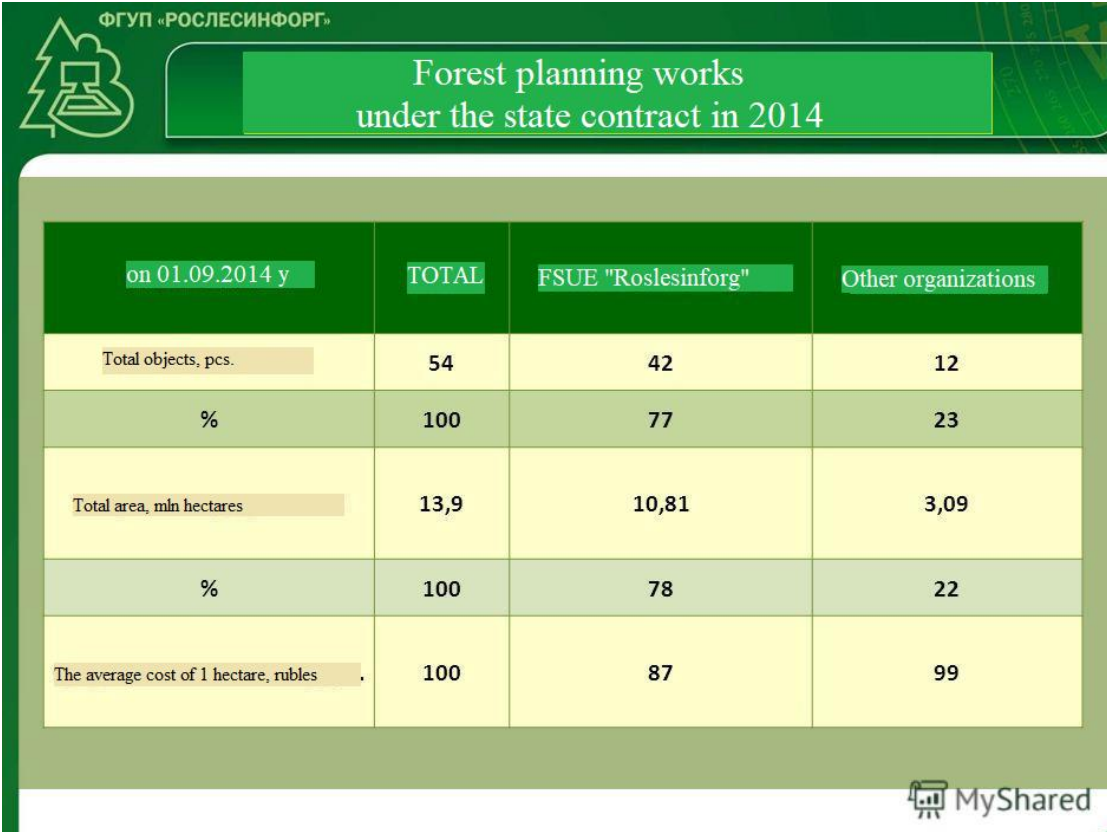
However, despite the supposedly liberal principles set forth in the legislation, unlike the examples of Finland, Poland and Estonia discussed above, there are a number of administrative barriers and restrictions for entering the market for the subjects of relations in the forest planning sector. These include the need to obtain a license to conduct geodetic and cartographic work of

federal designation, as well as the availability of a secret clearance of a forest planning organization and experts provided by the Federal Security Service of the Russian Federation.

These restrictions imposed on forest planning organizations for a number of objective and subjective reasons for many organizations (not for everyone) act as barriers to access to the forest planning sector in the Russian market.

Today the Russian market of forest planning is represented by the state sector represented by the federal state enterprise Roslesinforg with its territorial subdivisions and the private sector represented by numerous organizations of non-state ownership, performing a rather wide range of services in forestry and forest planning. According to various estimates of independent experts in the field of forest planning, the number of non-governmental organizations currently performing forest planning in Russia is about 160 - from very small to very large, significant in the whole forest regions. In total, the private sector now accounts for about a third of the total forest planning activities in Russia, including about a quarter under government contracts, and this share will inevitably grow due to the recent trend in the flow of Roslesinforg specialists to private forest planning organizations. Data on the volume of forest planning works performed under state contracts in 2014 is shown in Figure 20.

Figure 20. Forest planning works under state contracts in 2014



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Forest planning works under the state contract in 2014

on 01.09.2014 y	TOTAL	FSUE "Roslesinforg"	Other organizations
Total objects, pcs.	54	42	12
%	100	77	23
Total area, mln hectares	13,9	10,81	3,09
%	100	78	22
The average cost of 1 hectare, rubles	100	87	99

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In the forest sphere not only in Russia, but also in Belarus, there are a lot of absolutely opposite opinions about the development of Russian forest planning, the quality of work performed,

the negative impact of market instruments, herewith the concepts of forest planning and state forest inventory are often confused.

Quotations: *"There is a problem when executive bodies referring to the norms of federal legislation consider it obligatory to conduct an electronic auction when placing activities on forest planning. In this case, the contractors of the work are often the subjects of small and medium business who are not professionals in this field, and in some cases do not even have the same experience. This, of course, affects the quality of the results of forest planning "(member of the Commission of the Public Chamber of the Russian Federation on the development of the real economy Viktor Grachev).*

"Hackwork happens for those and others, but there is good work, and quality, in general, of forest planning depends on the qualifications and honesty of the contractors, and not on whether they work for a private trader or the state. You do not need to treat a private enterprise as an enemy - the quality of the work of a private forest planning is checked by the market. If they make the object bad or expensive, no one will come to order the work from them" (forestry scientist, forest manager R.F.Treifeld).

It should be noted that for a number of reasons, including due the lack of adequate budgetary financing, the volume of forest planning in the last decades has significantly decreased, especially this trend has intensified with the development of the state forest inventory system, in 2007, with the adoption of new legislation, there was a sharp reduction of forest planning activities, first of all forest taxation, which led to a significant reduction in the level of information support for the industry. The dynamics of the forest inventory is presented in Figures 21 and 22.

Figure 21. Dynamics of forest planning in 1965-1992

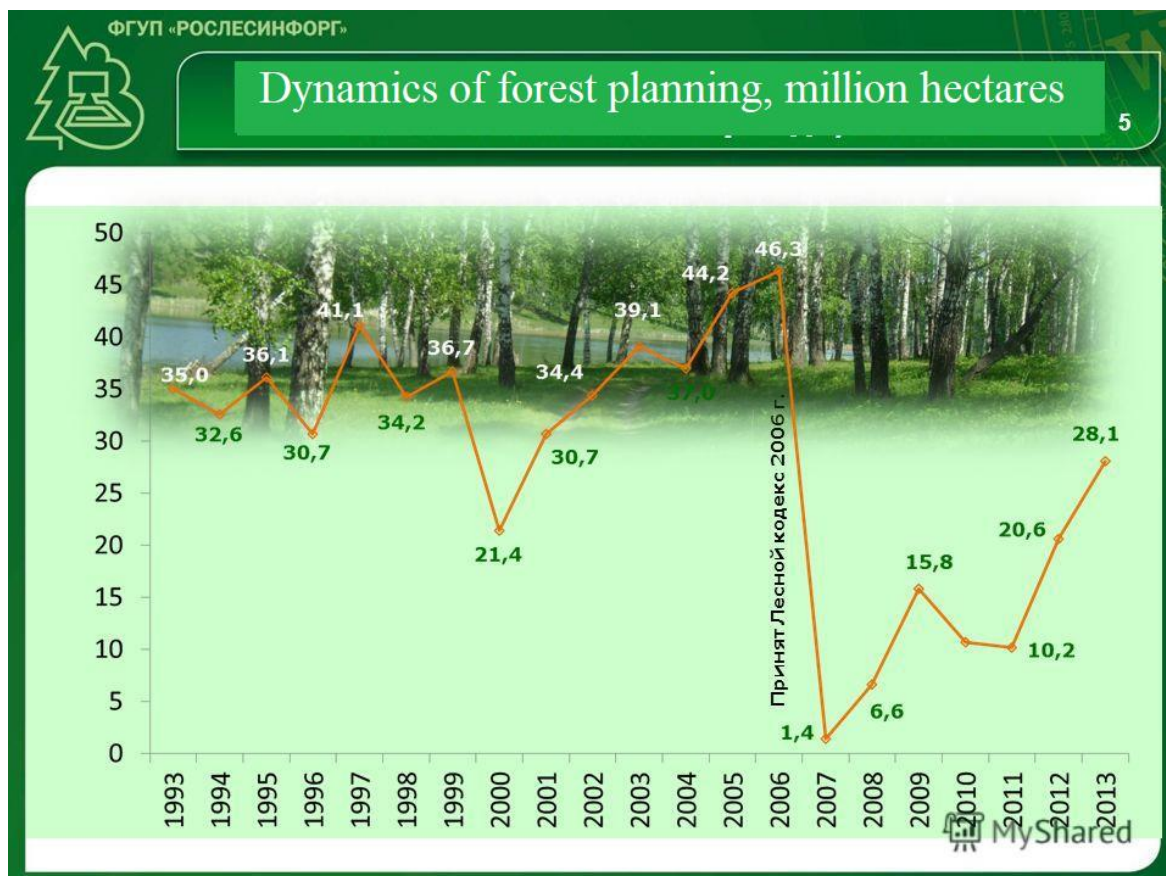
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Volumes of the main types of work performed from 1965 to 1992

Types of activities	Years of accounting					
	1965	1975	1980	1985	1990	1992
Forest planning, million hectares, including	42,9 100.0	50,9 100.0	72 100.0	72,3 100.0	70,7 100.0	63 100,0
Land-based method	39,5 92.1	46 90.4	46,8 65.0	47,3 65.4	50,7 71.7	42,2 67.0
The study of the forest fund by the method of cameral decoding of photographs	3,4 7.9	4,9 9.6	10,2 14.2	10 13.8	10 14.1	16,8 26.7
Inventory of reserve forests by satellite imagery			15 20.8	15 20.8	10 14.2	4 6.3

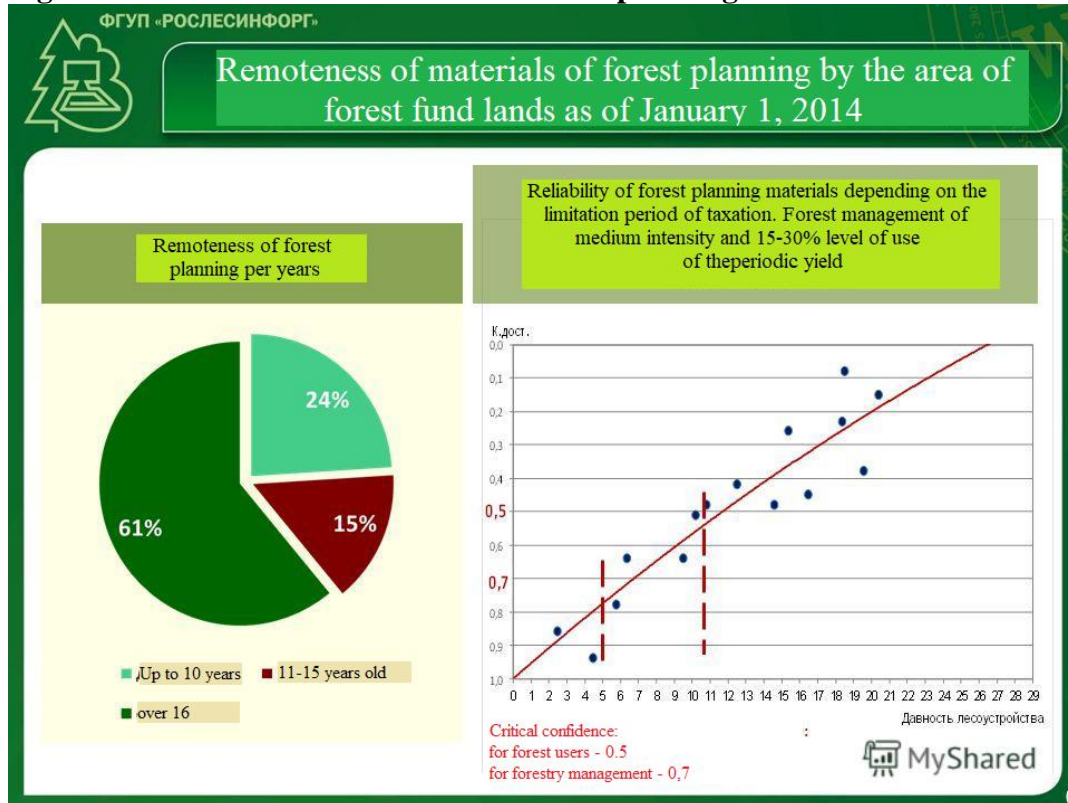
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Figure 22. Dynamics of forest planning in 1993-2013



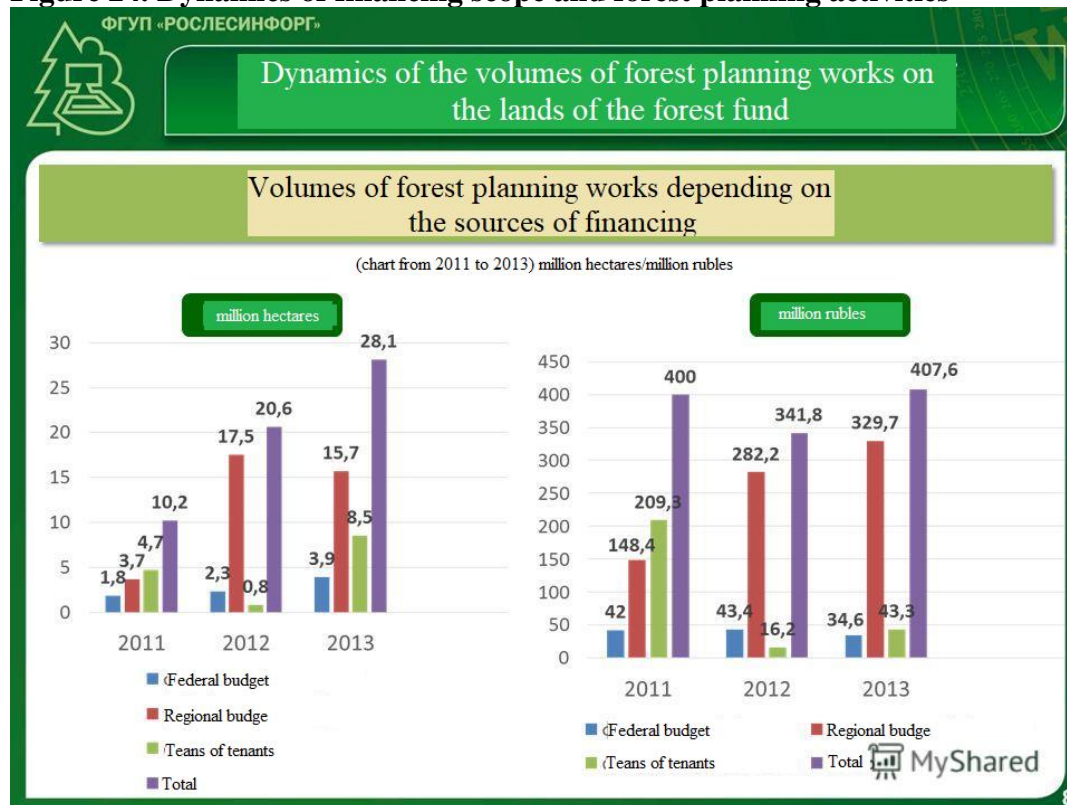
Today, only a quarter of information about the forests can be considered reliable, the taxation limitation of which does not exceed ten years. 61% of Russian forests are characterized by forest inventory materials, with a remoteness of 16 years or more. At the same time, a critical indicator of the relevance of forest taxation materials used for forest development takes place after 10 to 12 years from the date of its implementation, and in the case of intensive forestry, after 5 to 7 years. The long-term nature of forest planning materials according to the area of forest fund lands is presented in Figure 23.

Figure 23. Remoteness of materials of forest planning for the area of forest fund lands



However, the decrease in the scope of forest planning was not a consequence of changes in regulatory environment, or implementation of government decisions. In addition to the lack of real volumes of financing, the decrease in volumes occurred against the backdrop of growing volumes of cadastral work in the forests. Of the funds provided by the federal budget for forest planning, more than 70% (at least 3 billion rubles) were annually directed to cadastral accounting of forests, the expediency and relevance of which, according to respected experts and scientists, is highly questionable, especially for reserve forests and forests, not involved in intensive use.

The dynamics of financing and forest planning in previous years is shown in Figure 24.

Figure 24. Dynamics of financing scope and forest planning activities

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Along with the fall in the scope of forest planning, there was a general decline in its quality. Since the beginning of 2000, precision measuring and eye-measuring methods of forest have been replaced with less expensive ones. Already by 2010, forestation works on more than 70% of the area began to be performed without carrying out a full-scale inspection of forest plantations, using methods of updating the early forest planning materials. This state of affairs remains today.

The decision to grant forest users rights to conduct forest taxation did not lead to an exit from the current crisis. Unqualified and uncontrolled contractors of forest taxation activities began to overestimate the use of valuable species everywhere, "optimize" the age of the plantations, their composition and completeness. It should be noted that in the course of the state forest planning there were problems of a similar nature, and the quality of the work did not always correspond to the world standards.

The chronic problem of the Russian forest planning, both in the recent past, and especially now, is the unacceptably low level of payment for the contractors of the main production link - forest taxation. It so happened that the work of the taxator for a long time has steadily depreciated, and under the law of feedback, the quality of the inventory in the forest planning fell. This was especially evident in the years preceding the 2000s.

To raise the quality and prestige of forest planning, the issue of an adequate increase in the payment of extremely hard labor of forest taxators was not resolved. The cost of forest planning in the last years of the Soviet period was greatly underestimated, among other things, the reason for the

steadily declining quality of taxation, especially in the last years of the Soviet period. Today, the price of one hectare of the area under construction under state contracts is a maximum of 120 rubles. The cost of works on forest planning depending on the method of survey and location is shown in Figures 25 and 26. The share of the taxator's labor in the field works is approximately 15% of the total cost of the forest planning complex, or 18 rubles. per hectare.

Figure 25. The price of 1 hectare of forest planning works by methods of taxation, russian rubles.

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The price of 1 hectare of forest planning works in 2013 according to the methods of taxation (rubles).

Method of taxation	minimal	maximum	mean	Notes
1. Approximate (land-based taxation)	39	265	39,5	Forest management activities are appointed during the taxation
2. Deciphering	5	76	5,3	Forest management activities are not appointed during the taxation
3. Update	0,92	31	4,2	Forest management activities are not appointed during the taxation
Total			14,5	
Price for 1 hectare of the space image (resolution 1.5 - 3 m)	5	8	6,5	The price depends on the woodiness of the territory being managed
Price for 1 hectare of aerial photo (resolution 1.5 - 2 m)	7	10	8,5	The price depends on the average area of the plot and the woodiness of the territory being managed

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Figure 26. The cost of 1 hectare of forest planning activities in the federal districts, russian rubles

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Financing of forest planning in 2014

Federal district	Average cost per hectare in the tender documentation, rubles	Average cost per hectare under the contract, rubles	% decrease from the cost per hectare in the tender documentation
Central	89	87	2
Northwestern	131	122	7
Southern	154	149	4
North-Caucasian	170	162	5
Privolzhsky	129	113	12
Urals	51	47	7
Siberian	128	118	8
Far Eastern	179	91	49

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Taking into account the foreign experience of Sweden and Finland as an example, according to the data of METLA - the Forest Research Institute of Finland (senior researcher - Lopatin E.V.), the daily rate for forest taxation is 30 hectares, the cost of 1 hectare is 9 euros. Comparison of the cost of 1 ha of taxation shows that at **18 rubles in** Russia, its value in Finland (in the translation of the euro into rubles at the rate of 1 to 60) is 540 rubles i.e. exceeds the first rate for 30 times. The above comparisons show that almost nothing has changed in the wages level of forest managers from the Soviet period. And this is of great concern, since the requirements to the quality of taxation in a market economy inevitably increase.

Consumers of forest planning information are no longer satisfied with the description of the taxation description copied at the table-top and a recapitulated map-board of the previous forest planning. Modern forest planning customers need accurate taxation of each forest area, and this can be achieved only by a contact method - full-scale taxation, or in combination of full-scale taxation with remote methods - by deciphering remote sensing materials (aerial survey, space imagery).

Any of the methods of over-taxation mentioned above requires quantitatively new costs commensurable with the above taxation cost in Finland. Customers of modern forest planning should forget the well-known formula of the past: the taxator pretends that each sub-compartment is taxed full-scale, and the state pretends that it pays salary for this. In accordance with this, **120 rubles**

for 1 hectare, which is allocated today from the state budget for forest planning, is clearly not enough, and the real price starts from much higher indicators.

The quality of forest planning is also affected by the belated funding that has become habitual since the Soviet period. Indicative for this became the year 2014, when due to delayed payments, the actual duration of the field season lowered for more than a half with volumes calculated for the full field season. In such working conditions, it is hardly possible to seriously count on a satisfactory quality of taxation, and therefore, on forest planning materials in general.

The issue of the methodology of taxation, namely, taxation by the method of actualization, remains unresolved until the end. By itself, the "actualization" method, reduced to the transferring of ripening plantations into the ripe and automatic movement of the growing stock ages and part of the taxation indicators, did more harm than good. Actualization, as a rule, was carried out without full-scale taxation and all mistakes of previous forest planning tours were transferred to new databases.

State Forest Inventory (GIL): the objectives of the GIL are to assess the quantitative and qualitative characteristics of forests, applicable at high spatial levels: the Russian Federation, the forest area, the subject of the Russian Federation. Obtaining information on forests at the level of a forest sub-compartment, forest quarter or forest district in the conduct of a state forest inventory is not provided. In the national forest inventory, indicators should be identified, the assessment of which is necessary in connection with international obligations, including adaptation of forests to climate changes and their mitigation, conservation of forest biological diversity.

Information obtained during the state forest inventory is used to timely identify and predict the development of processes that have a negative impact on forests, assess the effectiveness of measures to secure, protect and reproduce forests, as well as for information support for forest planning.

When carrying out the state inventory of forests, methods of forest taxation are used, as well as methods of forest ecology. The GIL system in Russia began to take shape with the adoption of the Forestry Code dated 2006. The development and improvement of the GIL system was carried out at the Federal State Unitary Enterprise "Roslesinforg". Scientific studies, meetings of the scientific and technical council on the development of the GIL model applicable to the conditions of Russia were not conducted by the Federal Agency for Forestry. A very serious strategic mistake was the introduction of GIL in the whole country without its development in the pilot regions.

The first results showed that the principles of grouping (stratification) of forest taxation into the relatively homogeneous groups (strata) based on the materials of the forest inventory under the conditions of their low reliability due to the prescription of the forest taxation works resulted from the principles of the GIL (from 2011 methodological guidelines) lead to unreliable results. The idea

of stratification in the form in which it was proposed and implemented in its basis is not justified and is not true. The actualization of forest planning materials for economic activities and the impact of natural factors foreseen by the composition of works and obtained by deciphering high-resolution aerospace photographs could not be carried out, since it would require a full deciphering of forest taxation in vast territories.

Equally important, and in fact - decisive in choosing the inventory method, is the high cost of modern statistical inventories designed with observance of the laws of mathematical statistics. If you take as an example the national inventory of US forests, and translate its value to the area of forests of the Russian Federation, the annual expenses for the state inventory of forests in Russia will be at the level of 13.8 billion rubles annually.

Thus, laying the algorithms based on forest sub-compartments stratification into homogenous groups (strata) into the model of state forest inventory made the process of forests inventory dependent on the availability of up-to-date forest inventory materials, and the tasks of conducting GILs impracticable.

The existing model of carrying out the state forest inventory completely ignores the developed and approved remote methods of forest inventory, previously widely used in the practice of forest account (photostat method). Their use would make it possible to significantly shorten the GIL terms and costs. In addition, remote methods make it possible to take into account reserve and hard-to-reach forests with minimum costs and acceptable accuracy, where the laying of land trial areas is not always possible.

The implementation of GIL in the Russian Federation is entrusted to the federal forest planning body, which does not correspond to the generally accepted principles of the separation of powers in the management of natural objects and evaluation of their management effectiveness. In most cases abroad national forest inventories are conducted by research organizations, rather than bodies participating in forest planning processes. With this approach the Institute of Forest Inventory has received worldwide recognition and proved its effectiveness in achieving sustainable forest planning.

Since 2008, more than 250 million hectares of forests have been covered by the state forest inventory. However, in violation of federal legislation, information about any results of eight years of work in public space did not appear, including the Internet. The results of the GIL have not been brought to the bodies of state power, which ensure the formation and implementation of the state forest policy and the normative legal regulation of forest relations.

Conclusion: as a result of ill-considered reforms, the modern forest planning of the Russian Federation turned out to be in a crisis situation. The main reasons for which:

- lack of coordinated management;
- lack of clear regulation of processes;
- lack of sufficient budgetary funding.

A stable market model has not been formed and is not regulated at the proper level by the state, in fact a spontaneous market operates on the field of forest planning services. In order to draw attention to the qualitative composition of market participants through the certification or licensing of forest planning enterprises, as was done in Western countries, with the aim of allowing only professionals with modern technologies, tools, equipment, software, human resources, in Russia the criteria for selecting enterprises for those requirements that have absolutely no effect either on the quality of work (licensing of geodetic activities, licensing for admission to state secrets), or on the responsibility of organizations to the customer.

However, in principle, the introduction of market mechanisms can not be the cause or example of the negative impact of market models on forest planning. The market at the initial stage of its formation, before its departure to "free navigation" should be regulated by the state.

The scientist R.F. Treyfeld is the most authoritative specialist who has worked all his life in the forest planning, whose current work is heavily connected with the examination of forest planning results in forest areas, including for judicial purposes, notes that the quality of forest planning works carried out by private forest planning organizations, already in no way inferior to the quality of the same works carried out by state structures. "Hackwork happens for those and others, but there is good work, and quality, in general, of forest planning depends on the qualifications and honesty of the contractors, and not on whether they work for a private trader or the state. You do not need to treat a private enterprise as an enemy - the quality of the work of a private forest planning is checked by the market. If they make the object bad or expensive, no one will come to order the work from them". (7).

As for the current GIL, the statistical method adopted as the only one did not justify itself. The method does not provide acceptable neither qualitative nor quantitative characteristics of the country's forest fund. The strategic mistake of the GIL was the lack of understanding by its authors of the original meaning and significance of statistical methods and the role of the specifics of the conditions in which they are applied. The Russian forestry has not yet reached the extremely high fragmentation of the forests of Western countries, in which it becomes impossible to keep track of all changes in thousands and even millions of forest plots that are separated by type of ownership. There is also no total man-made impact on forests in Russia (the overwhelming majority), and therefore there is no need for a detailed, expensive tracking of its consequences, which, by the way, is an integral part of modern Western technologies of statistical forest inventories.

The question was why a technology was adopted which, according to its conceptual provisions and practical applications, was absolutely unsuitable for Russian conditions, and how it happened that it actually took the place of forest inventory in state budget financing today is on the agenda in the forestry circles of Russia.

The advantages of the market model of forest inventory organization are obvious and visible with the naked eye. The creation of a competitive environment in the market objectively contributes to:

1. Improving the quality of forest planning.
2. Introduction of the most cost-effective modern technologies, software, stimulates the transition from manual labor to machine, automation of technological processes.
3. Reducing the budget for forest planning.
4. Development of foreign markets, export of forest planning services.
5. Expanding the range of forest planning services.

Private companies that carry out forest planning and receive a positive characteristic from the customer tend to automatically gain competitive advantages in the market, information about such contractors spreads in the profile circles quite quickly, and, accordingly, forest owners are more interested in working with already verified organizations, thus, in the presence of a competitive environment, forest planning enterprises are interested in carrying out works with high quality, otherwise they simply don't establish on the market.

The market environment reduces the cost of services. Each forest planning manufacturer interested in gaining competitive advantages in the market at a price will maximize its costs - optimize logistics, overhead costs, bonuses to founders, enterprise management apparatus.

At first glance, if compared with developed countries (Finland, Sweden), in which a hectare of a taxation costs about 9 euros, it may seem that in Belarus the cost of forest planning (2-3 dollars per 1 hectare) can not be reduced, but such an analysis should be performed only with countries that are comparable in terms of economic development and average wages across the country. So, if in Sweden and Finland by the end of 2016 the average salary was 3.4 and 3.3 thousand euros per month, respectively, in Belarus and Russia, respectively, 384 and 547 dollars. Competitive cost of forest planning in Russia, depending on the average area of the sub-compartment and the total amount of work is 60-120 rubles. for 1 hectare or 1-2 US dollars. Therefore, in order to ensure competitiveness in the common market of Russia and Belarus, the cost of the work of the Belarusian forest planning enterprise in terms of full-scale inventory should be guided by these indicators (1-2 dollars per 1 hectare).

In this context, the functioning of forest planning enterprises on the rights of state ownership is inferior to private property due to a number of organizational features of forest planning structures - obligations to forest planning authorities to manage and maintain a forest planning database, develop new technologies for forest research and inventory, and other obligations to the authorities.

As a rule, modernization of technological processes is more effectively carried out in a competitive environment. The privateer counts his money, calculates and minimizes risks, costs, focuses modernization on the most up-to-date effective technologies that should give him a competitive advantage. However, the development of new forest planning technologies is quite a costly process and is accompanied by serious scientific research, therefore it is possible to introduce newer technologies into production, as a rule, only for large enterprises with sufficient working capital or enterprises with state ownership at the expense of budgetary subsidies. At the same time, in the absence of any competition, enterprises also lack the motivation to modernize existing technologies, facilities, equipment. And this ultimately leads to a complete loss of competitive advantages of such enterprises.

Increasing competitiveness and lowering prices, accordingly, reduces budget expenditures for forest planning, increases the potential for access to foreign markets, and stimulates the attraction of foreign exchange earnings to the country.

Analysis of the features of market models of forest planning shows that along with the positive effect of the introduction of market mechanisms in the countries under consideration there are also negative ones:

1. Subcontracting - there are facts when a customer makes a contract for forest planning with one organization, but actually another organization does the work, which the customer does not know or for objective reasons can not know, since the contracted service can be traded on the international service market. As a result of the lack of direct contact between the forest owner and the actual contractor of the forest planning work, work can not be carried out with the result expected by the customer. This situation is typical for the segment of the national market where dozens of enterprises are present.

2. You can not disregard unfair market participants who lack a long-term market strategy, and their priority is a one-time profit, not the quality of the work performed. According to experts, individual forest planning private enterprises, having performed works with low quality after

receiving the payment from customers, are liquidated, and in replacement of liquidated organizations new organizations are created with the involvement of the same employees.

3. When working with private enterprises there are risks of providing support for forest planning materials throughout the revision period of the forest planning project. Since the forest planning system provides for the development of forest management plans for the future up to 10 years, poorly executed work may not appear immediately, but in a few years, by that time the private organization that carried out forest planning can already be liquidated.

4. There is a lack of a system for monitoring the performance of forest planning operations, acceptance, approval and introduction of forest inventory materials. As a rule, a forest owner, due to his lack of specialized knowledge, can not ensure the proper level of control over forest planning.

5. The facts of regulation of the technology for carrying out work with technical specifications of free shape with deviations from the forest planning instruction and other normative documents are noted.

6. There are risks of entering a private forest planning enterprises market that is not regulated by the state and does not have the technical and technological equipment at the proper level with low-skilled specialists who are not able to carry out taxation at a high-quality level.

7. There are no clear criteria for selecting objects of work, there is no reasonable cost of forest planning works, depending on the ways and methods of taxation. Everything is determined by tender or by agreement.

8. There is no clear scheme of work organization depending on the sources of financing. If the objects under the state order and financed from the budget are placed on trading platform and the contractor is determined by the results of the auction or tender, then the issue is not settled by private forest owners or those, who lease land plots.

Conclusions and recommendations: the experience of the countries surveyed above shows that the transition to a free market of forest planning must necessarily take place in the intermediate stage of the market formation on which unambiguous state intervention is required. In order to prevent possible negative consequences, mayhem in the market the following points should be clearly regulated at the level of legislative acts:

requirements for organizations that will carry out forest planning (in terms of their technical and technological equipment, staffing);

forest planning technologies and methods of taxation that are common for all market participants;

unified approaches to organizing forest planning (the procedure for holding contests, bidding, lots, etc.);

the issue of the transfer of forest planning information and its integration in a single center;

the issue of control over forest planning, acceptance, approval and introduction of forest inventory materials;

the issue of support during the audit period of the developed forest management plan .

After the stabilization of the market, it is possible, with a view to simplifying the business, to reduce state regulation to a certain extent. Enterprises that have positively proven themselves and have a certain development potential will retain their place in the market and will be so-called objects that regulate it using market-based instruments and mechanisms, while the competitive environment will not allow small private traders, non-professionals with doubtful capabilities and the goal to gain one-time profit.

4. Development of proposals on the possibilities of forming a service sector in the field of forest planning design in the Republic of Belarus

Summary: This section considers the possibility of reforming the organizational system of forest planning in the conditions of the Republic of Belarus, and provides recommendations for regulating the forest planning market.

The question of the economic efficiency of forest planning and the possibility of creating a market for services should be considered in the scope of the entire forestry economy. And, referring to this topic, you can consider the existence of three economic models of forest planning:

market, when the revenue part of the forestry establishment (forest owner) is based on the market sale of forest products at prices dictated by the market with payment of the relevant rent for the forest land to the state;

planned-directive, when a forestry establishment (forest owner) is suspended from selling forest products, does not pay fees to the budget, and receives state subsidies from the budget for forest planning;

mixed, incorporating the elements of the first and second models in different proportions.

Belarusian forestry has more characteristics of the market model with centralized directive management and individual non-market elements, including forest planning. Indeed, today, forest planning needs to be turned towards the economy. It is unnatural, when functioning in a market environment, a sub-sector designed to prepare a foundation for planning forest exploitation and forest planning is not balanced with the laws of the economy. The role of forest planning in the forest management system can not be underestimated, and therefore it must be modern, efficient and fully meet the demands and requirements that are put to the forestry today - the rational use of the forest resource, professional management, economic efficiency, and the reduction of budget injections into the sector. Therefore, today we see an urgent need for reforming the forest planning and not for its cosmetic decoration, but for a constructive review of the foundations of its organization.

The prerequisites for this are laid down in legislation. The development of the service sector and the creation of a competitive environment in the area of forest planning (conducting tenders for the provision of forest planning services) with a view to improving the design of forestry and other activities is envisaged by the Sub-Program Increasing the Forest Resources Efficiency of the State Program "Belarusian Forest" for 2016-2020, approved by the Council of Ministers of the Republic of Belarus dated March 18, 2016 No. 215.

Based on the requirements of the State Program, the scope of forest services and the competitive environment in the field of forest planning should be created no later than 2020.

In accordance with Article 35 of the Forestry Code of the Republic of Belarus, the Council of Ministers of the Republic of Belarus is authorized to identify organizations that conduct forest planning in the forests of Belarus.

Thus, the new code, which became effective on January 1, 2017, in contrast to the Forest Code of the year 2000 that was effective till 2017, determines the possibility of forming a forestry planning service sector in the country from 2017 to 2020.

The capacity of the market of forest planning services in Belarus is about 1 million hectares per year or 10 forestry institutions with an average area of 100000 hectares. Forest planning under a single centralized management RUE "Belgosles" is conducted by 4 forest inventory expeditions - 1st Minsk, 2nd Minsk, Gomel, Vitebsk, which are quite able to carry out forest planning without additional administrative regulation from RUE "Belgosles", which actually only distributes the scope of work and financing for expeditions and issues the documents regulating the production process.

In the current conditions, the formation of a market of services in the field of forest planning design in Belarus is possible by restructuring the management structure of the existing forest planning enterprise Belgosles - decentralize the forest planning. Based on the existing 4 forest planning expeditions subordinate to Belgosles, create independent state forest planning enterprises with direct subordination to the Ministry of Forestry. Contracts for forest planning activities must be concluded between the customer (forestry establishment) and the forest planning organization based on the results of the tender. The competition can be held on open Belarusian trading platforms or by holding a tender by the customer. On the basis of the fact that it is most expedient to assign one forest planning unit to one forest planning organization with full preparation of all forest planning documentation and writing a forest planning design, then one whole lot of the forestry enterprise should be placed in one trade lot (one organization, the winner of the tender, charges 1 forestry enterprise and develops forest management plan). Competitive selection of the contractor organization is advisable to organize in accordance with the qualification requirements, the minimum cost of work, the timing of implementation (in descending order).

Annually about 10 similar lots will be formed in the forest planning market (by the number of forestry enterprises). As a consequence, the most optimal number of forest planning organizations for Belarus is 4 to 5 pcs. (2 facilities per enterprise) with a staff of taxators up to 20 people. The calculations are based on an average production rate per taxator of 2000 hectares per month and a field period of 6 months (from May 15 to November 15). 1 taxator performs 12000 ha

per year, respectively, an object of 100 thousand hectares requires 8.3 taxators, provided they are fully loaded. 1.7 taxators are a reserve in case of sickness, dismissal, vacation and other objective reasons. Thus, for the implementation of work in the forestry enterprise 10 taxators, 20 taxators for 2 objects, which will be performed by the enterprise, are required.

Administration of the management process (management, control, accounting and economic support of production) can be realized with the involvement of additional 3-4 staff units:

director - performs managerial, organizational and administrative functions, control over the work of taxators;

chief engineer - carries out the organization of the production process and control over the whole process;

economist-accountant - carries out accounting and economic functions of the enterprise;

lawyer - provides legal support of production, conducts workflow management.

A similar structure of forest planning enterprises is widely used in Russia, Western countries and private Belarusian forest planning enterprises oriented to foreign markets. The difference is only in the norms of output per worker. In Russia, for example, one taxator performs 3 to 4 thousand hectares of approximate taxation per month on the first category of forest planning, in Europe 500-1000 hectares of enumeration taxation, in Belarus - about 2000 hectares of approximate taxation.

Thus, from the calculation of 4 to 5 independent state forest planning enterprises for the implementation of forest planning in Belarus, without changing the norms of production, 90-100 taxation engineers with a total management apparatus of 15-20 people will be required each year.

The question arises as to how and where the forest planning information will be integrated - maps, projects, taxation description, etc., and who will issue technical regulations regulating production.

For the transfer of forest planning information, its integration into a single database, storage, and administration, it is expedient to create a republican information forest center with a staff of up to 5 people with direct subordination to the Ministry of Forestry.

Documents that regulate forest planning, the production process, the work of tax collectors should be taken at the level of the Ministry of Forestry. This may be a TCEP, Instruction or other similar regulatory document.

In order to prevent sharp gatherings of financial and economic activities of RUE "Belgosles", decrease of financial indicators, loss of jobs, it is advisable to carry out reforming with preserving state forest planning.

In the future, upon achievement of the expected positive effect, the output of state-owned enterprises to the level of competitiveness comparable to private structures, it is possible to involve

private forest planning companies in the area of forest planning. However, for admission of private traders to the market, appropriate state regulation is required. In this regard, it is proposed to develop and approve the minimum requirements that these organizations must meet for participation in tenders:

the forest planning organization must be registered in the Unified Register of Legal Entities of the Republic of Belarus with the main activity - forest planning;

presence in the staff of the organization of at least 10 engineers-taxators to ensure the taxation of at least one forestry enterprise (1 lot);

presence in the organization of at least 10 sets of measuring instruments necessary for field measurements (altimeter, angle gauge, coring instrument, etc.);

presence in the organization of at least 10 computers with the necessary software and keys to it (this is necessary so that each taxator can process the forest planning data);

the work experience of the engineers declared on the site must be at least 5 years (in conducting field work), trainees and workers with less experience can be in the organization, but the work can only be done under the supervision of an experienced engineer-taxator (mentor);

availability of attestation of engineer-taxators, confirming their professional qualities (by analogy with the experience of Estonia).

The tender is proposed to the organizations that have a minimum capital sufficient to organize a forest planning process, purchase of a forest planning framework (pictures), conduct preparatory, training, pay workers for at least 3 months, conduct tax, payments to National Social Security Fund and other payments.

It is proposed to include only those organizations that meet the minimum set of requirements listed above and do not have negative experience in forest planning (facts of poor performance, refusal to perform work, others) into the list of organizations that can carry out forest planning approved by the Council of Ministers.

Advantages of the proposed reform:

1. Heads of independent forest planning enterprises will be encouraged to reduce production costs in order to obtain competitive advantages over other organizations on the trading platform. **The cost of forest planning will decrease. For example, if the cost of 1 hectare of forest planning is reduced from \$3, as now in Belarus, to \$1-2, as in Russia, then 1-2 million dollars annually can be centrally directed to the modernization of forest planning enterprises, and subsequently left in the budget.**

2. Each enterprise will strive to perform the work as qualitatively as possible in order to obtain a high appraisal from the customer, to prove itself in the market as a responsible quality

performer for receiving further orders. **The quality of forest planning will inevitably increase. For any objective reasons, none of the enterprises will be interested in lagging behind. Otherwise, it can not become a full participant in the market.**

3. Due to the lower cost of work and funds savings, it is possible for the Ministry of Forestry to set up a targeted forest inventory fund which can be distributed to enterprises, into the scientific sphere for the development of new forest planning technologies, software, and purchase of modern forest planning equipment in order to further develop and reduce costs. With the introduction of high-performance technologies for processing forest planning data, the transition from manual processing to machine, labor automation, costs will decrease, and competitiveness will increase. **Modern highly efficient technologies will be introduced, which will allow to further reduce costs, gain competitive advantages in foreign markets, and increase salaries for tax collectors.**

4. Entering the external markets of the EAEU (Russia) with competitive technologies will create a multiplier effect. Enterprises will begin to expand, develop markets for related land management services and other areas. **The list of services provided by the enterprise, including those in foreign markets, will expand. The company's revenue will increase, including the currency one.**

5. Conducting a forest planning by not one, but several enterprises due to the desire to improve the quality of work will allow to obtain more objective forest planning data. I.e. contact at the level of the forestry enterprise-forest planning enterprise under the control of market factors will no longer allow to mitigate the assessment of the quality of forest planning activities, the designation of their volumes, etc. **Independent assessment of forests and implementation of economic measures.**

The effectiveness of the proposed model is obvious and does not require additional tranches from the budget. It is quite possible to modernize forest planning technologies using the means currently allocated for forest planning, but not efficiently distributed and used. Development is advisable to be implemented by reducing the cost of work and economy, which is more justified to direct to new scientific developments (new technologies for deciphering, updating, etc.), software development, purchase of new modern high-precision equipment.

Proposed stages of reform:

1. The adoption of a normative document - a forest planning instruction in which uniform (impersonal) requirements applicable to all participants of the forest planning market in terms of technologies, methods of forest planning, methods of taxation, control and other features will be prescribed.

2. Adoption of the regulatory document on the reorganization of UE "Belgosles" - exceptions from the structure of the enterprise and re-subordination of two subsidiaries directly to the Ministry of Forestry: the Gomel and Vitebsk expeditions, two Minsk expeditions, the creation of the Republican Information Forest Center on the basis of UE "Belgosles".

3. Use of the Belarusian Universal Commodity Exchange (the department of forest products) with a view to conducting competitive bidding (procurement) for the right to conduct forest planning works (forest planning facilities are distributed among the forest planning enterprises through a tender).

The customer of the forest planning activities shall determine the forestry enterprise, which places the lot (the basic forest planning on the whole territory of the forestry enterprise with the development of the forest management plan), pays with its own resources for the performance of work, carries out quality control.

4. In the future, the introduction of measures for state regulation of the forest planning market (subject to the admission of private forest planning organizations to this market).

Conclusions and recommendations: the conditions of forestry management in Belarus in the market environment allow us to talk about the possibility and even the need to form a service sector in the field of forest planning design. The forest planning market will allow to implement the forest planning with the least expenditure, with the highest quality, using the new modern technologies and tools taking into account the economic efficiency.

Taking into account the example of Ukraine, where forest planning is carried out by several state forest planning organizations in today's conditions, so the most economically justified model for Belarus will be the state forest planning market with four state forest planning organizations, and only after their adaptation to market conditions, to a competitive environment we can talk about a possible allocation of private companies there. At the same time, the market should be regulated. With this approach, the organizational structure of the forest planning can be presented in the form of a centralized state structure, for example, a structural subdivision of the Ministry of Forestry with regulatory functions and state and non-state organizations. Such a structure will correspond to the model of a market economy, while simultaneously responding to the principle of public-private partnership. At the same time, the legal regulation and control remains with the state represented by the central state body as the state administrative structure.

Control over compliance with the requirements of forest planning is expedient for the Ministry of Forestry, customers with equal responsibility for compliance with laws, enforcements and regulatory framework of forest planning by all participants of the forest planning market, regardless of the form of ownership.

For the formation of forest planning services in the Republic it is recommended:

1. to approve a single methodology for forest planning for all organizations (forest planning instructions);
2. to create a trading platform (electronic resource) for placing lots for basic forest planning;
3. to approve the mechanism for selecting organizations for forest planning (qualification requirements, cost of works, terms of work, other conditions);
4. to approve the methodology for calculating the starting price of lots (basic forest planning), using a differentiated approach (depending on the conditions of forest growth, types of forest, composition of plantations, complexity of work and other factors);
5. to approve the procedure for conducting electronic trading, a list of documents required for filing an application for participation in the auction;
6. to identify sources of funding for forest planning (budgetary funds, own funds of forestry enterprises, other sources);
7. to approve a unified methodology for assessing the quality of field and table-top forest planning works (customer, Ministry of Forestry, country's control bodies);
8. to approve the minimum qualification requirements for organizations and specialists (engineers-taxators);
9. to prepare amendments to the law (the decision of the Council of Ministers of the Republic of Belarus, which approved the procedure for conducting forest planning and the list of organizations conducting forest planning, Law of the Republic of Belarus dated July 15, 2010 No. 169-3 "On objects only in the ownership of the state, and the types of activities for which the exclusive right of the state extends" with a view to excluding forest planning from the list of activities for which the exclusive right of the state is distributed and the implementation of the exclusive right of the state to carry out certain activities).

In the same vein, the development of the Russian forest planning market is being discussed today. Last year, at a meeting of the Public Chamber of the Russian Federation, it was proposed to take measures to regulate the forest taxation market.

According to L. Mikheeva, a member of the Public Chamber of the Russian Federation, one of the proposals that the Public Chamber will apply to the relevant government bodies will be the integration of disparate information about the boundaries of forest areas into a single register. According to her, the problem of transferring public powers to "outsource" to private structures concerns not only the forestry sector, and a state approach is needed when solving it.

With this approach, the Director of the Department of State Policy and Regulation in the Field of Forest Resources of the Ministry of Natural Resources of Russia A.Gribennikov agrees that specialized organizations "whose employees have appropriate knowledge and skills" must carry out the taxation and the key measures for forest protection.

Experts in the field of forest planning today agree on a common understanding that the market for taxation services needs to be regulated through the certification of specialists.

Similar proposals, according to information of V.Grachev, a member of the Public Chamber, will be sent to the Ministry of Natural Resources of the Russian Federation, the Federal Forestry Agency and regional environmental management agencies to improve the legal regulation of the industry (21).

5. Conducting analysis of the possibility of creating a competitive environment for forest planning organizations in order to improve the quality of forest planning design and suggesting ways of its formation (taking into account the peculiarities of forest planning in the Republic of Belarus)

Summary: This section considers the possibility of creating a competitive environment in the market of forest planning services. The possibility and recommendations for increasing the efficiency and competitiveness of Belarusian state forest-management enterprises are analyzed.

Like any kind of activity, forest planning works are associated with costs. And these costs must be borne by the customer of this service - the forest owner (forest fund holder). Forest taxation should be carried out according to the latest, economically justified and optimal in terms of price-quality ratio technologies. Nevertheless, forest taxation remains a rather labor-consuming and costly process with a 2-3-year technological cycle. The basic, initial cost of works on forest taxation (per 1 hectare) is ranked by methods and categories and is determined by the cost norms for these purposes. The cost norms are calculated on the basis of the technological schemes for performing the taxation work, given in the forest planning instruction, using typical examples of objects using forestry norms in the elements of work (22). In case of establishment of a market for forest planning services in Belarus, specific contractors and the final price for this service will be determined as a result of competitive procedures in the free market. Accordingly, with the introduction of market mechanisms, the focus will be on the issue of competitive advantages that can be obtained by each particular enterprise depending on a number of factors:

- professionalism of management, its business qualities;
- professionalism of workers (engineers-taxators) and, accordingly, quality of taxation;
- use of modern high-performance technologies, automation of technological processes (replacement of manual labor by machine);
- remoteness of the location of the forest planning enterprise from the object of work;
- rate of profit and, accordingly, the price of the services provided.

These are key factors affecting competitiveness, however, depending on the nature of the enterprise, others are also possible, for example, the level of remuneration in various regions of the country (the average salary level in Gomel is lower than in Minsk, i.e. Gomel enterprise can gain a competitive advantage over Minsk), rent for the premises (the rent level in Minsk is higher than in Gomel), etc. However, it is advisable to consider the key factors affecting efficiency.

Today, in the general access in the Internet, you can find a lot of examples of the application of modern competitive forest planning technologies. Also, effective models of business management, including forest planning companies, are not a secret, an example of countries with a

large number of forest planning organizations in the market shows that the rotation of personnel from one forest planning enterprise to another partly contributes to the exchange of information, the transfer of more efficient technologies. Placement of a price proposal for a complex of works on forest planning is often placed in the Internet. Of course, the level of possible price reduction, which acts as the subject of negotiations between the customer and the contractor, is a trade secret, however, there are certain frameworks for market orientation.

All this suggests that the basic information needed to make management decisions to improve competitiveness is available. If desired, you can easily calculate the arrival and wages of competitors and use it for your corporate purposes - minimize costs, improve the efficiency of management processes, improve technology. Forest planning is not such high-tech sector as, for example, 3D printing, nanotechnology, robotics for the development of which huge amounts of research and inventions are needed. In the forest planning it is quite effective to use what has already been developed and justified itself in practice. These technologies and tools have already been considered in the previous sections of this work, so we propose to discuss in more detail the price factor of competitiveness.

Today it can be said with certainty that in order to be competitive in the Russian market it is necessary to have the opportunity to conduct forest planning at a price of 60-80 rubles per 1 hectare or 1 - 1.3 US dollars (here and further in the text we consider a forest planning of the first category with full-scale approximate and approximate-measuring taxation, the exchange rate of the Russian ruble to the dollar is 1:60).

The example of the Russian Federation for the price level is given for the following reasons:

1. Formation of a single market of services without exceptions and limitations in the Eurasian Economic Union (Russia, Belarus, Kazakhstan, Armenia, Kyrgyzstan). It is expected that until 2025 a single market of services without barriers and free access of legal entities of one country to provide services on the territory of the country-parties will be formed.

2. Comparable level of economic development, wages, tax payments.

For the same reasons of disparate economic conditions, it is not possible to compare objectively the price level for forest planning with such developed European countries as Sweden, Finland and others.

Thus, for the effective work of Belarusian forest planning enterprises, the cost of forest planning should be reduced from today's 2 to 3 dollars per 1 hectare to 1 - 1.3 dollars per 1 hectare . Otherwise, we will not only be able to enter the market of the EAEU, making a worthy competition to Russian companies, but without introducing protectionist measures that may not allow us to enter, we will lose our own market.

How can this be done? In the previous section, we examined the optimal structure of the forest planning enterprise, which is typical for the countries of Europe, Russia and which allows you to work with maximum efficiency and profit. Let's consider an example - the area of the forest planning object is 100 thousand hectares. Conditionally we accept the value of the contract based on the results of the tender for \$ 1.3 per 1 hectare (80 Russian rubles) 130 thousand dollars for the whole object and suggest considering the structure of actual costs (real figures) for the work:

1. The cost of the forest planning basis (4-zone, spectral space imagery from the French STOT satellite - 6.7) is about 3.5 dollars per 1 sq. km., 3500 dollars per 100 thousand hectares. We multiply this amount by a factor of 1.5 - 2; not only forest lands will be presented on the image, but also agricultural fields, settlements, etc. **The result is \$5000 - \$7000 (3.8-5.4% of the contract amount).**

2. Preparatory work (space images processing, transformation of the previous forest inventory tours into images, for example, in the Topol-M software package, printing of images, 1:10000 scale cutting, organization and conduction of the 1st forest planning meeting, laying trial plots for collective training and conducting collective training, including transportation costs for all components) is estimated at **\$ 7000- \$ 8000 (about 6% of the contract amount).**

3. Field work (salary of engineers-taxators, which includes the amount necessary to move to the object of forest planning, travel and daily expenses; it must be noted that the taxator does not pay for housing at his own expense, housing on the site is provided by forest planning organization; as a rule, housing can be provided by a forest owner without charge or for a nominal fee, which is also typical for the conditions of Belarus) amounts to **\$32500 (about 25-30% of the contract amount).**

4. Cameral works (maintenance and improvement of software, subscription fee for keys to computer programs, additional registration of taxation cards, scanning of deciphered images, vectorization, development of statements, development of forest management plans , and, if necessary, forest planning regulations, project protection, organization and conduction of forest planning meeting) amounts to **\$20000 (about 15% of the contract amount).**

5. Related costs (vaccinations, logistics, maintenance of measuring equipment, spare parts, accommodation, quality control and other costs) amounts to **\$6000 - \$7000 (about 5 - 6% of the contract amount).**

6. Taxes (profit tax, real estate tax, legal address tax, payroll tax, Federal Tax Service, and other taxes) amounts to **\$20800 (about 16% of the contract amount).**

7. Enterprise development - step-by-step introduction of new technologies for collection and processing of forest planning information (order of applied scientific developments to improve

methods of taxation and processing of taxation data, including table-top interpretation, custom programming) amounts to **\$20000-\$25000 (about 15- 20% of the contract amount)**.

8. Profit (salary of the director, founder) amounts to **\$15000-\$20000 (about 12 - 14% of the contract amount)**.

It should be noted that the calculation of the share of wages of taxators is at the level of up to 30%, rather than the generally accepted 15%. This is done for the sole purpose - to provide decent conditions for labor remuneration, to fix highly qualified personnel, to compensate people as much as possible for inconvenience from difficult living conditions and not simple work, even for forestry. This encourages taxators to hold on to the post, work with maximum efficiency, minimize employee turnover. As a consequence, the required quality of the taxation is ensured. For comparison, RUE "Belgosles" in which the salary level of the taxator is reduced to a critical minimum. At a rate of 2 thousand hectares per month, the average wage is about 1000 belarusian rubles or 8% of the contract value of 1 hectare. This factor can certainly be considered on the other hand, if an enterprise is able to provide a decent quality of work at such a level of payment by, for example, rigid management and total control of taxators, this should be taken as a competitive advantage in the market.

Nevertheless, Belarusian forest planning enterprises should focus on the average monthly salary of engineers-taxators in the amount of \$1000-\$1500 with a taxation of about 3 thousand hectares per month, as in neighboring Russia. Otherwise, the enterprise's potential in the market will be lower due to a low level of competitiveness in terms of quality factor.

Improving the quality of work performed by increasing the salaries of contractors and reducing the cost of work performed due to effective management opens the possibility for Belarusian forest planning enterprises to expand the geography of exports in the market of forest planning of the EAEU, including Russia.

However, for full participation of Belarusian enterprises in the Russian forest planning market, it is proposed to remove certain administrative barriers, the existence of which contradicts the Treaty establishing the Eurasian Economic Union.

The Republic of Belarus, as a full member of the Eurasian Economic Union (the Treaty on the Eurasian Economic Union, May 29, 2014) has the opportunity to enter the external markets of services, including forest planning in the forests of the EAEU countries (Russia, Kazakhstan, Armenia, Kyrgyzstan) without any tariff and non-tariff restrictions, while receiving competitive advantages.

The forest planning market of Russia, Kazakhstan, Armenia and Kirghizia is open to the forest planning organizations of the Republic of Belarus, but temporarily the forest planning

organizations registered in the countries listed above do not have direct access to forest planning in the Belarusian forests, which enables Belarusian forest planning to adapt to market realities.

According to the Individual National List of Restrictions, Exemptions, Additional Requirements and Conditions within the Eurasian Economic Union for the Republic of Belarus, approved by the Decision of the Supreme Eurasian Economic Council dated December 23, 2014 No. 112, only the Belarusian forest planning enterprise has the right to conduct forest planning in Belarusian forests.

What are the barriers that need to be destroyed? In accordance with the Federal Law of the Russian Federation "On licensing certain types of activities" dated 04.05.2011, No. 99-FZ (as amended on July 13, 2015), according to Article 12, paragraph 42, the following activity is subject to licensing: geodetic and cartographic works of federal purpose, the results of which have a national, cross-sectoral significance (with the exception of these activities carried out during engineering surveys performed for the preparation of project documentation, construction, reconstruction, capital repair of capital construction projects).

On the other hand, the Federal Law of the Russian Federation No. 5485-1 dated 21.07.1993 (as of 08.03.2015) On State Secrets does not contain direct norms indicating that cartographic materials (topographic maps, aerial and space imagery, other cartographic documents) are the information constituting a state secret for work with which you need to obtain an appropriate license to work with materials constituting a state secret.

It should also be pointed out that the management of forest inventory is not performed on topographic maps with 1:10 000 scale, which are secret, due to the fact that mainly the space survey is used, which is initially tied to the coordinate network. Proceeding from this it follows that, in fact, the forest planning does not use information that constitutes a state secret, hence the requirements from participants in the procurement of a license to conduct works related to the use of information constituting a state secret is not lawful.

Establishment of a requirement that a participant, when placing an order, must have a license to conduct works that relate to the use of information constituting state secrets when making purchases from January 1, 2014 under Federal Law No. 44-FZ dated 05.04.2013 (as amended from 13.07.2015) "On the contract system in the sphere of procurement of goods, works, services for provision of state and municipal needs" (as amended and supplemented, entered into force on September 15, 2015), these actions may be recognized as a violation of one or more of the following norms of the mentioned Law: Part 2 of Art. 8; Section 1, Part 1 of Art. 31; Part 6 of Art. 31.

These issues require solution and creating transparent working conditions in the market of forest planning in Russia.

For access of foreign companies, in particular Belarusian ones, to the forest planning market of Russia, there are barriers and restrictions on the part of financial organizations and banks.

The overwhelming number of electronic auctions in public procurement of the Russian Federation is held at the following three platforms:

Sberbank-AST (Electronic platform of the Savings Bank of the Russian Federation);

ETP "MICEX";

RTS-Tender.

Each of them has a personal user's office, in which it is necessary to replenish the account in Russian rubles for further provision of applications for participation in electronic auctions.

In order to deposit a certain amount of money in Russian rubles into a personal account on any of the electronic platform where electronic auctions are held in Russian rubles, the banks of the Republic of Belarus require a basis for this in the form of a signed bilateral agreement referring to the legislation on currency regulation.

Naturally, the Belarusian organizations do not have a contract yet, since the auction on this object was not even held. Thus, there is no possibility to replenish accounts on electronic platforms from the foreign currency account (Russian rubles) to further secure applications for participation in electronic auctions.

The electronic platforms themselves do not provide any contracts. These problems exist only among the enterprises of the Republic of Belarus, enterprises of the Russian Federation quietly participate in auctions without any restrictions and replenish accounts on electronic platforms.

One of the ways out is the replenishment of accounts on electronic platforms in cash on the territory of the Russian Federation. However, such a mechanism goes beyond the legal framework and is in fact a serious breach of the financial activities of the enterprise, which will eventually be punished in accordance with the law.

Thus, Belarusian enterprises can not even provide an application for participation in electronic auctions on Russian electronic platforms, not to mention the very participation in them.

Due to the circumstances, it is possible, of course, to work through mediation agreements with organizations that have received a contract at the competition, but this will reduce profits.

Conclusions and recommendations: in case of creation of a market for forest planning services in Belarus, competitiveness in the market will depend on several key factors: the effectiveness of enterprise management (management professionalism), the quality of the work

performed (executors professionalism), the desired level of net profit, and the technology of work. The potential for increasing competitiveness lies in the optimal ratio of all these factors.

If we follow the model proposed in this paper, obtaining competitive advantages for the cost of the work performed will reduce the state allocations for forest inventory implementation by a factor of 2, **the annual savings will be about 1.5 million dollars.**

The two-times growth of wages of engineers-taxators will increase the responsibility of specialists for the work performed and, accordingly, will improve the quality of forest inventory and the designation of economic activities. Competition will occur in the forest planning labor market.

Reducing the costs of work will provide a competitive advantage in the external market. As it was mentioned in the previous section of the work for the implementation of the forest planning in Belarus, without changing the production norms, from 90 to 100 taxation engineers with a general management apparatus of 15-20 people (no more than 15-20% of the employees' staff) will be required, 105-120 people totally. Today, the staff of RUE "Belgosles" is more than 300 employees; accordingly, unused workers (more than 200 people) are recommended to target on foreign markets, they can **perform works on the export market on more than 2 million hectares, which is another 2.6 million dollars of export proceeds.**

Regarding the results, as a result of the reform, due to savings (\$ 1.5 million) and the development of export markets (\$ 2.6 million), it will be possible to receive at least \$ 2 - \$ 3 million of additional funds annually that are recommended to be accumulated in the fund for the development of the forest planning and, at the direction of the Ministry of Forestry, assign them to develop new forestry technologies, research and development and development engineering, purchase of high-performance measurement tools, software development.

6. Action plan for transition to a market of services in the field of forest planning design

The preconditions for the transition to a market of services in the field of forest planning design are laid down in legislation. The development of the service sector and the creation of a competitive environment in the field of forest planning (tenders for the provision of forest planning services) with a view to improve the design of forestry and other activities is envisaged by the Sub-Program Increasing the Forest Resources Efficiency of the State Program "Belarusian Forest" for 2016-2020, approved by the Decision of the Council of Ministers of the Republic of Belarus dated March 18, 2016 No. 215. Based on the requirements of the State Program, the scope of forest services and competitive scope in the field of forest planning must be created no later than 2020.

The capacity of the market of forest planning services in Belarus is about 1 million hectares per year or 10 forestry institutions with an average area of 100000 hectares. Forest planning under a single centralized management of RUE "Belgosles" is conducted by 4 forest planning expeditions - 1st Minsk, 2nd Minsk, Gomel, Vitebsk, which are quite capable of carrying out forest planning without additional administrative regulation from RUE "Belgosles", which actually only distributes the scope of work and funding for expeditions.

In the current conditions, the formation of a market of services in the field of forest planning design in Belarus is possible by restructuring the management structure of the existing forest planning enterprise Belgosles - decentralize the forest planning. Based on the existing 4 forest planning expeditions subordinate to Belgosles, create independent state forest planning enterprises with direct subordination to the Ministry of Forestry. Contracts for forest planning activities must be concluded between the customer of activities (forestry establishment) and the forest planning organization based on the results of the tender on the trading platform of the OJSC "Belarusian Universal Commodity Exchange". On the basis of the fact that it is most expedient to assign one forest planning unit to one forest planning organization with full preparation of all forest planning documentation and writing a forest management plan, then one whole lot of the forestry enterprise should be placed in one trade lot (one organization, the winner of the tender, taxates 1 forestry enterprise and develops forest management plan). Competitive selection of the contractor organization is advisable to make in accordance with the qualification requirements, the minimum cost of work, the timing of implementation (in descending order).

Annually about 10 similar lots will be formed in the forest planning market (by the number of forestry enterprises). As a consequence, the most optimal number of forest planning organizations for Belarus is from 4 to 5 pcs. (2 facilities per enterprise) with a staff of taxation engineers up to 20 people. The calculations are based on an average production rate per taxator of 2000 hectares per month and a field period of 6 months (from May 15 to November 15). 1 taxator

performs 12,000 ha per year, respectively, an object of 100 thousand hectares requires 8.3 taxators, provided they are fully loaded. 1.7 taxators are reserve for sickness, dismissal, vacation and other objective reasons. Thus, the implementation of work in the forestry enterprise requires 10 taxators, 20 taxators for 2 objects, which will be performed by the enterprise.

For the transfer of forest planning information, its integration into a single database, storage, and administration, it is expedient to create a republican information forestry center with direct subordination to the Ministry of Forestry.

Documents regulating forest planning, production process, taxators work should be taken at the level of the Ministry of Forestry.

Advantages of transition to the market:

1. Heads of independent forest planning enterprises will be encouraged to reduce production costs in order to obtain competitive advantages over other organizations on the trading platform. **The cost of forest planning will decrease. For example, if the cost of 1 hectare of forest planning is reduced from \$3, as now in Belarus, to \$1, as in Russia, then about \$2 million annually can be centrally directed to the modernization of forest planning enterprises, and then left in the budget.**

2. Each enterprise will strive to perform the work as qualitatively as possible in order to obtain a high appraisal from the customer, to prove itself in the market as a responsible quality performer for receiving further orders. **The quality of forest planning will inevitably increase. For any objective reasons, none of the enterprises will be interested in lagging behind. Otherwise, it can not become a full participant in the market.**

3. Entering the external markets of the EAEU (Russia) with competitive technologies will create a multiplier effect. Enterprises will begin to expand, develop markets for related land management services and other areas. **The list of services provided by the enterprise, including those in foreign markets, will expand. The company's revenue will increase, including the currency one.**

4. Conducting forest inventory by not one enterprise, but several due to the desire to improve the quality of work will allow obtaining more objective forest planning data. **I.e. contact at the level of the forestry enterprise-forest planning enterprise under the control of market factors will no longer allow mitigating the assessment of the quality of forest planning activities, the designation of their volumes, etc. Independent assessment of forests and implementation of economic measures.**

The effectiveness of the proposed model is obvious and does not require additional tranches from the budget. It is quite possible to modernize forest planning technologies using the means currently allocated for forest planning, but they are not efficiently allocated and used. Development

is advisable to be implemented by reducing the cost of work and saving, which is more justified to direct to new scientific developments (new technologies for deciphering, updating, etc.), software development, purchase of new modern high-precision equipment.

For the transition to the free market of forest planning, it is proposed to settle the following issues at the level of legislation, which should be clearly regulated:

requirements for organizations that will carry out forest planning (in terms of their technical and technological equipment, staffing);

forest planning technologies and methods of taxation generalized for all market participants;

unified approaches to organizing forest planning (the procedure for holding tenders, bidding, lots, etc.);

the issue of the transfer of forest planning information and its integration in a single center;

the issue of control over forest planning, acceptance, approval and introduction of forest inventory materials;

the issue of support during the audit period of the developed forest planning project.

Therefore, the transition to the market of services in the field of forest planning planning is proposed to be carried out in several stages (Table 7):

Stage I 2017 - 2018 Formation of the regulatory framework;

Stage II 2019 Reorganization of RUE "Belgosles" of a monopoly body in the field of forest planning and creation of a national forest information center instead;

Stage III Modernization of forest planning technologies, software development.

Table 7. Action plan for transition to a market of services in the field of forest planning design

No	Activity	Form of realization	Executive in charge	Implementation period	Description
1.	2.	3.	4.	5.	6.
I. Formation of the regulatory framework					
1.	Approve the updated forest planning instruction	Decree of the Ministry of Forestry on the approval of forest planning instruction	Ministry of Forestry	2017 - 2018	The forest planning instruction should contain uniform requirements applicable to all participants of the forest planning market in terms of technologies, methods of forest planning, methods of taxation and other features of forest planning.
2.	Approve the methodology for assessing the quality of field and table-top forest planning works	Decree of the Ministry of Forestry on the approval of the methodology for assessing the quality of forest planning works	Ministry of Forestry	2017 - 2018	The methodology for assessing the quality of field and cameral forest planning works to be carried out should contain general requirements for conducting quality control checks on forest planning, the right of the customer for forest planning during inspections, the Ministry of Forestry, and the country's control authorities. At the same time, the quality control of the implementation of forest planning works should not be a test of the financial and economic activities of the forest planning organization.
3.	Prepare amendments to the Law of the Republic of Belarus dated July 15, 2010 No. 169-3 "On objects that are only in the ownership of the state, and types of activities for the implementation of which the exclusive right of the state extends"	Law of the Republic of Belarus	The Parliament of the Republic of Belarus	2017 – 2018	Exclude forest planning from the list of activities for which the exclusive right of the state applies

No	Activity	Form of realization	Executive in charge	Implementation period	Description
1.	2.	3.	4.	5.	6.
4.	Prepare amendments to the Resolution of the Council of Ministers of the Republic of Belarus dated November 4, 2016 No. 907 "On measures to implement the Forestry Code of the Republic of Belarus"	Decree of the Council of Ministers of the Republic of Belarus	Council of Ministers of the Republic of Belarus	2017 – 2018	Since the list of organizations that have the right to conduct forest planning is approved by the Council of Ministers of the Republic of Belarus, so in order to form a market for forest planning services in Belarus, it is required to register a list of independent forest planning organizations controlled by the Ministry of Forestry and having the right to conduct forest planning in Resolution No. 907.
5.	Approve the qualification requirements for forest planning organizations and specialists (taxating engineers) and the list of documents required for filing an application for participation in the tender (the list of documents must confirm the qualification requirements for the forest planning organization)	Decree of the Ministry of Forestry	Ministry of Forestry	2017 – 2018	The decree should include the following requirements for forest planning organizations: - registration in the Unified Register of Legal Entities of the Republic of Belarus with the main activity - forest planning; - presence in the staff of the organization of at least 10 taxating engineers to ensure the taxation of at least one forest enterprise (1 lot); - presence in the organization of at least 10 sets of measuring instruments necessary for field measurements (altimeter, angle gauge, coring instrument, etc.); - presence in the organization of at least 10 computers with the necessary software and keys to it (this is necessary so that each taxator can process the forest planning data); - the work experience of the engineers declared on the site must be at least 5 years (for conducting field work), trainees and workers with less experience can be in the organization, but the work can only be done under the supervision of an experienced

No	Activity	Form of realization	Executive in charge	Implementation period	Description
1.	2.	3.	4.	5.	6.
					taxating engineer (mentor); - availability of attestation of taxating engineers, confirming their professional qualities.
6.	Approve the mechanism for selecting organizations for forest planning	Decree of the Ministry of Forestry on approval of the mechanism for selection of forest planning organizations for forest planning	Ministry of Forestry	2017 - 2018	The organization for forest planning should be selected according to the following criteria (in descending order): - full compliance with qualification requirements; - cost of works (based on the cost of 1 hectare of forest); - performance time
7.	Approve the methodology for calculating the starting price of forest planning lots	Decree of the Ministry of Forestry on the approval of the methodology for calculating the starting price of forest planning lots	Ministry of Forestry	2017 - 2018	The starting price of the forest planning lot (carrying out 1 hectare of basic forest planning) should take into account the differentiated approach (depending on the conditions of forest growth, forest types, stand composition, complexity of work performance and other factors). The initial bidding price is recommended to be set starting from the level of the cost price of works with a price increase step of 5% from the starting price.
II. Reorganization of RUE "Belgosles", a monopoly body in the field of forest planning					
8.	Reorganization of RUE "Belgosles"	Order of the Ministry of Forestry	Ministry of Forestry	2019	Exclusion from the structure of the enterprise and re-subordination directly to the Ministry of Forestry of two subsidiaries: the Gomel and Vitebsk expeditions, two Minsk expeditions giving them the status of a legal entity.
9.	Creation of the Republican	Order of the	Ministry of Forestry	2019	4 independent forest planning organizations should

No	Activity	Form of realization	Executive in charge	Implementation period	Description
1.	2.	3.	4.	5.	6.
	Information Forest Center on the basis of UE "Belgosles"	Ministry of Forestry			submit forest management plans to the Republican Information Forestry Center, and the center should store all forest planning documentation (forest management plans, map boards, maps), keep a record of the forest fund throughout the country.
10.	Determination of financing sources for forest planning (budgetary funds, own funds of the forestry enterprises, other sources)	Order of the Ministry of Forestry	Ministry of Forestry	2019	To increase the responsibility of the forest planning customer for carrying out forest planning on its territory, the forestry enterprises should finance the carrying out of the forest planning activities independently - from own sources (budget funds allocated for forest planning, funds from wood sales, self-financing activities, other sources).
11.	Optimization of staffing establishment of state forest planning companies	orders of state forest planning companies	state forest planning companies	2019	The staffing establishment must be approved according to the formula 80% of the taxation specialists (20-25 professional specialists), 20% of the administrative staff (5 managers: director, chief engineer, economist, accountant, lawyer).
III. Modernization of forest planning technologies, software development					
12.	Formation of a forest planning development fund intended for the purchase of new forest planning technologies, research and development and development engineering, procurement of high-performance measurement tools, software development	Opening of the account of the Ministry of Forestry	Ministry of Forestry	Since 2020	The Fund will be formed by the Ministry of Forestry at the expense of saved funds for forest planning and distributed among state forest planning organizations for specific innovative projects. When bidding for the implementation of forest planning at the JSC "Belarusian Universal Commodity Exchange" and competition for forest planning contracts, the cost will be reduced from \$3 per 1 hectare to \$1 per 1 hectare. The annual savings under the taxation of 1 million hectares will be about 2 million US dollars.

No	Activity	Form of realization	Executive in charge	Implementation period	Description
1.	2.	3.	4.	5.	6.
13.	Purchase of new technologies, software development	tender, financing	state forest planning companies	2020-2021	Procurement of the development of the technology of taxatory deciphering and software for it. Procurement of the development of the technology of the zonal method of forest planning and software for it. Purchase of Field-Map.
14.	Purchase of measuring equipment, modern forest planning devices	tender, financing	state forest planning companies	2020-2021	Purchase of Getac T800-Ex field tablets (1 piece, 2,5 thousand USD). Purchase of laser range-measuring equipment Nikon Forestry 550 (1 piece 500 USD). Purchase of the Dendroscope program. Purchase of the Masser Sonar forest taxation kit (1 piece, 4 thousand USD).
15.	Scientific support of modernization	Research and development	state forest planning companies	2020-2021	Purchase of scientific engineering development for air laser scanning LIDAR.

Conclusion

The contractor is grateful to the Ministry of Forestry, RUE "Bellesexport", the Global Environment Fund for support and the opportunity to state a private opinion on the problem of reforming the forestry sector in Belarus, improving its efficiency.

The proposed model of reform is based on the best international experience of forest planning development, all possible errors of reform which other countries had to face. Recommendations for the purpose of excluding similar negative consequences or minimizing their consequences in the conditions of the Republic of Belarus were analyzed.

This research can be used by the Ministry of Forestry and UE "Belgosles" as a recommendatory document in the preparation of program documents on the reform of the national forest planning.

The implementation of the proposed reforms, according to the authors of the research, will make the forest planning of Belarus not only a profitable efficient segment of the forestry sector of the economy, but will also attract additional foreign exchange earnings to the country, cut budget financing for forest planning by at least 2-3 million dollars, optimize forest planning schemes, will allow the introduction of the most advanced high-performance and competitive technologies and equipment without additional financing.

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Annex to the report

Consolidated form on the results of a survey (questionnaire) of state production forestry associations, forestry enterprises, RUE "Belgosles" in order to identify problematic issues of the current system of forest planning

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest planning organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
Brest SPFE								
SFE Baranovich Forestry Enterprise			Interaction with the forest planning organization is organized in full measure	With more precise mapping	Not required	Possible, but with full support of the work on the plan before the end of its operation		Due to the lack of personal experience of acquaintance with the practical work of other countries, I find it difficult to answer
SFE Brest Forestry Enterprise		Low quality of the approximate taxation of forest plantation (inaccurate determination of the volume, stock, composition of plantation), errors in cartographic materials, discrepancy of the data of the taxation description to the field survey. The design of	To a sufficient degree	Automation and creation of more advanced automated systems in the field of forest planning using space technologies and UAVs	Such a market is necessary, because there should be a choice of organizations that provide quality forest planning services. Form of ownership - private	Possible	The formation of the market for forest planning services should be carried out gradually, over a period of 5-10 years	The experience of carrying out forest planning in Finland will be most effective for Belarus

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
		reforestation activities is not in accordance with PTH						
SFE Gantsevi chi Forestry Enterprise	In the age of information technologies and the use of the GIS Forest Resources Program and AWP Forest software it is inappropriate to continuously make handwritten changes (inscriptions and diagrams-drawings) in the taxation description and map-boards. All data exchange could be done in the electronic form	The taxator actually is not present in all areas during the conduct of forest planning. Materials of planting of forest cultures are not always studied reliably. As a result, there is an appointment of the main use plantation 5-10 years of age into cutting, planted forest cultures are often "lost" from the taxation descriptions. There are cases of "disappearance" of quarters in the taxation descriptions sent out annually after	In most cases, the interaction is at a sufficient level. I would like to improve the interrelationship between the organizations especially at the end of the period of the forest management plans when there are absent or limited selections of sites for cutting according to the estimated cutting area	In the future, I see the following: forestry management is carried out by the forest manager of the forestry and the forest manager himself decides on the appointment of certain types of cutting and other forest planning and silvicultural activities, since the forest manager has sufficient knowledge of normative and technical documentation and has practical	I think that the market of forest planning services in the Republic of Belarus is not required	Yes, it is possible	The market of services needs to be formed gradually in the course of 3 years, since certain knowledge and skills are required to perform these services. I think that workers of forest planning organizations will take the initiative themselves when this service market appears, and its further development will depend on the amount of money that the forestry enterprises will be willing to pay for the full range of forest planning	Not sure. But due to the fact that at the moment by the order of the Head of the State of the Republic of Belarus the forestry of Belarus is guided by the experience of Finland, the forest planning of this state, if it is held there, is most suitable for Belarus

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
		the introduction of changes.		experience in applying his knowledge and skills. After carrying out the approximate taxation by the forestry enterprise (forestry), the data are sent to RUE "Belgosles", where on the basis of these data, a calculated cutting area and a forest management plan are formed. The forest management plan itself is of a recommendatory character			services	
SFE Drogichin	No	The configuration of the sub-compartments	Enough	Precise	Owned by state	Do not conduct by private forest planning	We are not supporters of the formation of a	No answer

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
Forestry Enterprise»		should be closer to rectilinear. Depart from the small contours of sub-compartments with the same taxation characteristics.				organizations. All emerging issues in the forest planning project is easier to regulate in the state structure. Questions in the conduct of author supervision	market for forest planning services in the Republic of Belarus.	
SFE Ivatsevichi Forestry Enterprise»			The interaction between the SFE Ivatsevichi Forestry Enterprise and RUE Belgosles is structured to a sufficient degree. Problematic issues are resolved promptly.	For more productive work, the forest planning organizations lack the more experienced taxators who have worked for more than one year in the forestry, who will be more conscientious about their job duties	The market of forest planning services in the Republic of Belarus is not necessary to create; there may be no quality of forest planning.	Forest planning by private forest planning organizations should not be carried out, because so-called fly-by-night companies can appear, and who will be responsible after carrying out forest planning (in case of reorganization of such companies) and with whom current issues will be solved?		
SEFI Kobrin		Poor quality of field forest	Yes		Yes. At least two organizations.	Yes	Gradually, for several years. With	

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
Experimental Forestry Enterprise		planning. (Change of the prevailing species on the sub-compartment, change of the economy, inaccuracy of the measurement of areas)			Public and private. To improve the quality of forest planning operations with healthy competition.		compulsory licensing of this type of service	
SFE Luninets Forestry Enterprise		Low quality of the approximate taxation of forest plantation (inaccurate determination of the volume, stock, composition of plantation), errors in cartographic materials, discrepancy of the data of the taxation description to the field survey. The design of reforestation activities is not in accordance with PTH	To a sufficient degree	Automation and creation of more advanced automated systems in the field of forest planning using space technologies and UAVs	Such a market is necessary, because there should be a choice of organizations that provide quality forest planning services. Form of ownership - private	Probably	The formation of the market of forest planning services should be carried out gradually, over a period of 5-10 years	Polish experience of forest planning for Belarus will be most effective
SFE			Yes	High-level	There must be	No. In 2015 we		

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
Lyakhovich Forestry Enterprise				specialists, precise forest-taxation characteristics of the forest fund	competition, so at least two organizations, but with the condition of having proper specialists	faced private organizations for the registration of forest fund lands. Everyone wants to earn, but there is not enough knowledge (hence the quality)		
SFE Malorita Forestry Enterprise	Appointment of the main use plantations for the prevailing species into cutting (pine, spruce, birch.). Assign to the enterprises under conditions that allow carrying out cutting in accordance with the current TCEP	Increase the quality of taxation (boundaries of sub-compartments, areas of forest cultures, composition of plantations)	Enough	With more accurate referencing by the coordinate system with the updating of materials annually on satellite images	No	Not yet	No	Finland
SFE Pinsk Forestry Enterprise			Enough	With using space technologies	The market of forestry services is necessary - quality will be improved and the cost of forest planning works will be	Possible	Gradually, for several years	Polish experience of forest planning

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
					decreased. Form of ownership does not matter			
SFE Polesye Forestry Enterprise		Low quality of the approximate taxation of forest plantation (inaccurate determination of the volume, stock, composition of plantation), errors in cartographic materials, discrepancy of the data of the taxation description to the field survey.	To a sufficient degree	Automation and creation of more advanced automated systems in the field of forest planning using space technologies and UAVs	Such a market is necessary, because there should be a choice of organizations that provide quality forest planning services. Form of ownership - private	Probably	The formation of the market of forest planning services should be carried out gradually	
SFE Pruzhany Forestry Enterprise	Appointment of the main use plantations for the prevailing species into cutting (pine, spruce, birch.). Assign to the enterprises under conditions that allow carrying out cutting in accordance with	We see no problem	To a sufficient degree	Forest planning should be more precise and use advanced digital technologies in its work.	No	No	No	Finland

Forestry enterprise	Problematic issues of applying in practice the current documents on regulating forest planning activities	Problematic issues of the current system of organization of forest planning activities	Interaction of the forestry enterprise with the forest planning organization	Forest planning of the future	Is the market of forest planning services necessary in the Republic of Belarus?	Is it possible to carry out forest planning by private forest planning organizations in the republic	The expediency of forming a market for forest planning services (simultaneously or gradually)	The experience of which countries in the field of forest planning is most suitable for the conditions of Belarus
	the current TAP							
SFE Stolin Forestry Enterprise	No	The plan begins to operate only a year after the field works. In the set of cutting areas for all types of cuttings, the age of the plantation specified during field work should be extended for the entire duration of the plan, rather than changing by year	Yes	Aerial photography was replaced by space photography. The accuracy of the area of sub-compartments is reduced to a minimum. The inventory materials and tablets are on electronic media	Yes. At least five with private and state ownership.	Yes	Five years	Not sure.
SFE Telehany Forestry Enterprise	The need for forest planning institutions to assign this or that form of cleaning cutting, depending on the forest growing conditions and the state of the growing stock themselves	There is a discrepancy between the taxation characteristics of the sub-compartment with full-scale data	Good working relations have been established with the forest planning organization	The use of more detailed space imagery	It is necessary to develop a market for forest planning services, at least two organizations, which will allow them to produce these works more competitively on the basis of competition	It is possible to carry out forest planning through a private forest planning organization in the republic	Gradually, within 5 years	The Republic of Poland, the establishment of a system of forest statistics
Vitebsk SPFE								
SFE	In connection	As a result of the	The interaction is	Highly qualified	Organizations	No, due to the		The experience of

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Begoml Forestry Enterprise	with the entry into force of the new version of the Water Code dated April 30, 2014 No. 149-3 and the entry into force of the new edition of the Forestry Code dated December 24, 2015 No. 322-3, revision of the "Regulations on the procedure for the allocation of forests to groups and categories of protection, the transfer of forests from one group or category of protection to another, as well as the allocation of specially protected forest areas," "Regulations on the procedure for	inaccuracies in the taxation during forest planning, the forestry industries have to make out additional documents, while making changes and additions to the existing forest management plans is made on a fee basis	organized at the proper level: changes to the draft of basic forest planning were introduced in 2012, 2015.	specialists responsible for inaccuracies in taxation	engaged in forest planning services should be state-owned, since forests are state property.	existing experience of work and the equipment of state structures		forest inventory management in the Baltic States and Poland is most suitable, because of high accuracy of taxation, maximum use of digital technologies, widespread use of GIS technologies

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	establishing the size and boundaries of water protection zones and coastal strips of water bodies and regime management of economic and other activities spine", "Resolution of Ministry of Forestry on certain questions of state accounting of the forest fund", as a fundamental change occurred in approach to the distribution of forests by groups and categories of protection							
SFE Beshenkovich Forestry Enterprise	In practice, the existing documents do not have specific problems	I do not see any problems with the existing system of forest planning	The interaction of the Beshenkovich Forestry Enterprise with the forest planning organization is	With the help of modern technique and technologies, the level of forest planning will be	I think yes. They should be private and public, so that there is competition	I think it's possible	I think that it is advisable to form gradually over 5-10 years	The experience of neighboring countries, because we have a similar species composition and

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			organized to an adequate degree	increased, with more accurate taxation indicators, forest resources will be more rationally used				similar growing conditions
SFE Bogushevsk Forestry Enterprise	No	No	Sufficiently		Yes, state	No	Gradually (not enough organizations will be formed at once)	Russia (similar inventory methods and forest fund)
SFE Verkhnevinsk Forestry Enterprise	No	Poor quality of field work. Numerous discrepancies between forest planning materials and survey data (mismatch in the species composition, contours of sub-compartments, stock, age of the plantation)	Sufficiently	Forest planning which will be recommendatory in the implementation of forestry activities based on economic factors	Yes. Number of organizations necessary to perform forest planning. In private ownership	Probably	Gradually over 5 years	No
SFE Vitebsk Forestry	Difficult to answer	A choice of periodic yield areas for cutting of	The interaction of our forestry establishment with	Based on market relations with mandatory	There should be the market of forest planning	It is possible to carry out forest planning by private	The market of forest planning services should be	Not sure

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Enterprise		intermediate use is carried out according to the types of cuttings, with the inclusion of sites that are transferred to another type of cutting at the time of the plan entry into force. Thus, the actual volume of cuttings for a particular species does not correspond to reality	the forest planning organization is organized to an adequate degree	control of state bodies	services both in the preparation of the plans and for the implementation of sub-compartments. We believe that both state and private ownership should exist	organizations under the control of the state forest planning body in the Republic of Belarus	gradually formed in order to bring the legislative base in line with the process of formation	
Glubokiy Experimental Forestry Enterprise	Absent	In the course of forest planning, there are cases of inaccuracies in the allocation (establishment of boundaries) and taxation, in connection with which the forestry enterprises have to make out additional	The interaction of our forestry establishment with the forest planning organization is organized to an adequate degree	Forest planning in the future will be carried out only by highly qualified specialists, responsible for the inaccuracies of the taxation	Forest planning services should be only of state ownership, since forests are the property of the state	No, since forests are the property of the state		I am not thoroughly acquainted with the experience of foreign countries in the field of forest planning

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		documents and approvals. At the same time, changes and additions to existing forest management plans are made on a fee basis						
SFE Gorodok Forestry Enterprise		No	The interaction is organized to an adequate degree		Must be state-owned	No	Gradually, for three to five years	Poland
SFE Disna Forestry Enterprise			Sufficiently		The market of forest planning services in the Republic of Belarus is necessary and necessary for both private and state forms of ownership, which is an increase in competitiveness and, accordingly, the "price-quality" ratio	Forest planning by private forest planning companies is possible		
SFE Dretun			Sufficiently	Without paper media	No	No		Poland

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Forestry Enterprise								
SFE Lepel Forestry Enterprise		Insufficient use of digital technologies	Sufficiently		Should be state-owned; at least three, to create a competitive environment and thereby improve the quality of services		Gradually, for five years. It is necessary to determine the requirements for forest planning and the final result	
SFE Liozno Forestry Enterprise		Identification and registration of animals and plants included in the Red Data Book of the Republic of Belarus: forest managers take data from district inspections of natural resources and environmental protection as a basis, which often become obsolete. It is necessary that this work is carried out by the forest planning together	Yes		No	No		Poland

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		with the ecologists in the basic forest planning						
SFE Orsha Forestry Enterprise		Identification and registration of animals and plants included in the Red Data Book of the Republic of Belarus: forest managers take data from district inspections of natural resources and environmental protection as a basis, which often become obsolete. It is necessary that this work is carried out by the forest planning together with the ecologists in the basic forest planning	Yes		No	No, who will be responsible in case of liquidation of private forest planning organizations		Russia
SFE Polotsk Forestry Enterprise		The implementation of forest planning works and the land management	The interaction is established to an adequate degree	First of all, the forest planning organization should be responsible for	Forest planning activities are conducted once every 10 years, and even more,	No	We are not supporters of the forest planning services market	Experience of Scandinavian countries

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		system are not coordinated		carrying out forest planning activities; the quality of forestry activity depends on the accuracy of the forest planning	what kind of market can be talked about, the fewer organizations - the better, by the form of property-state-owned.			
SFE Postavy Forestry Enterprise	In connection with the emergence of the new Forest Code, forest groups and categories of protection will change	In the current forest planning system, the problematic issue is inaccurate taxation, the need to write various changes	The interaction of our forestry establishment with the forest planning organization is organized to an adequate degree	Use of new technologies, methods of forest taxation. including the use of remote sensing materials of the Earth	No	Realization of forest planning by private forest planning organizations in our republic is possible, but for this they need the experience gained in carrying out forest planning, like in the state forest planning structure		Poland, Finland
SFE Rossony Forestry Enterprise	According to the forest planning instruction, the growing stock taxation is carried out along the tiers and the age of the main species is	Mapping materials and taxation characteristics arrive late, there is no possibility to check everything on time	SFE Rossony Forestry Enterprise closely cooperates with the forest planning organization	More precise, error-free		Possible, because the market offers, as a rule, several offers, ie there is a choice: who is better and cheaper	But it must be done gradually. At the first stage, as an experiment	The experience of Russia in the field of forest planning is appropriate for Belarus

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	established along the upper tier. In the selection of cutting areas for a clear-felled method of cutting in 2 tiers, there is a change of species (often from foliage to pine needles). In the "Rules for tapping and taxation .." it is recorded that in complex and uneven-aged growing stock trees are counted by tiers and age generations, but when it comes to issuing a cutting ticket in the Automated Workspace "Forest use" program, this can not be done. According to the							

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	Rossony forestry enterprise it is the No. 1 problem, because everywhere (especially in the case of a deciduous areas) spruce renewal prevails							
SFE Surazhskiy Forestry Enterprise						Yes	Gradually	Russia
SFE Tolochin Forestry Enterprise		Insufficient use of digital technologies	The interaction is organized to an adequate degree		Should be state-owned. At least three companies independent of each other, to create a competitive environment and thereby improve the quality of services	No. Private structures will be financially interested in carrying out work and there are risks of unreasonable increase in the cost of work. When carrying out forest planning works by private organizations, a state organization	Gradually, within five years. It is necessary to determine the requirements for forest planning, the final result and with a degree of responsibility and submission to one management center	

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						will be needed that will monitor the quality of work performance, in conditions of the Republic of Belarus it is not expedient		
SFE Uschatchi Forestry Enterprise	The assignment of conversion cut in their last aging year		Sufficiently	Continuous forest planning	The market of forest planning services is necessary, the organizations must be of different forms of ownership	Possible and necessary	Can be done immediately with the availability of qualified specialists	Perhaps Poland
SFE Schumil'n Forestry Enterprise			Sufficiently		Yes, private ownership	Yes	Gradually	
Gomel SPFE								
Buda-Koshelev Experimental Forestry Enterprise			Sufficiently	Continuous forest planning	Required, competition, quality, cost reduction of services	Yes, competition, quality, cost reduction of services	Gradually, with the formation of the market of services	I have no information on the experience of other countries in the field of forest planning

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SFE Vasilevichi Forestry Enterprise	Definition of age, type of growth, creation of forest cultures or reservation under natural renewal, transition of cutting areas from one district to another	Insufficient experience of taxators for conducting field works	Sufficient degree of interaction between the forestry enterprise and the forest planning organization	More promising, operational and targeted	A market of forest planning services is needed in Belarus. State property, as well as private property, is required for a more responsible approach to forest planning and competition development	Possible	Gradually. Within 5-7 years	
Vetka Special Forestry Enterprise			Yes		Yes, at least 3 organizations, the form of ownership doesn't matter	Yes, possible	Gradually	Poland
SFE Gomel Forestry Enterprise		Long term between fieldwork and forest management plan	Work with the forest planning organization is organized at the proper level, there are no comments		Services for conducting forest planning works are needed, because this type of work is specific for the forestry sector; the number of organizations is not less than 4; the form of	It is possible under the condition of obtaining a certificate of a standard pattern, or a license to produce these works	Immediately - because is unknown what methods and technologies can be implemented in the future in forest planning	

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					ownership is state and private			
SFE Elsk Forestry Enterprise			Yes	Continuous	No	No, due to the fact that private ownership implies limited liability		
SFE Zhitkovich Forestry Enterprise			Yes	Every year the quality of forest planning activities is getting worse	Yes, the more - the better, the quantity - the competition - the quality	Yes	Gradually, with the analysis of efficiency and the possibility of gradually solving possible difficulties	
SFE Zhlobin Forestry Enterprise	Typology of the site, the definition of ages, the creation of forest cultures or the reservation of natural regeneration, the transition of cutting areas from one district to another	Lack of taxators experience to conduct field surveys	Sufficiently	Promising, operational, up-to-date	Perhaps state and private property, no less than three companies to develop competition and strengthen the company's responsibility	Possible	Gradually	
SFE Kalinkovich Forestry Enterprise	No comments	No comments	The interaction is not organized at a sufficient level: the taxators when decrypting the AP set up the areas to	The system of qualitative assessment of the forest fund, based on modern technology	The market is necessary, market liberalization will increase the quality of forest services, all forms	Possible	The market should be formed gradually, as this will bring better results	Poland, Finland

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			the sub-compartments without paying attention to the fact that these sub-compartments have already been passed through the instrumental survey in the forestry enterprise and the areas for them have already been determined, resulting in a discrepancy. First of all, this refers to cutting, not transferred forest cultures.		of ownership should be present			
SFE Komarin Forestry Enterprise		The accuracy of determining the boundaries of taxation sub-compartments, the composition of softwood plantations, when deciphering AP	Sufficient					
SFE			Yes	More precise				Not competent in

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Lelchitsy Forestry Enterprise				with respect to the boundaries of allotments, composition, age				this issue
SFE Loev Forestry Enterprise	No offers	No offers	Yes	Digital technologies will be used more widely, the accuracy of taxation will be increased and the cost of forest planning activities will be decreased (I hope)	It is necessary. The form of ownership is not important. The competition and the struggle for quality are important	It's possible, given the will. A competent approach to business can be organized in both private and state organizations	Gradually. Everything must be planned	We need to improve our own system
SFE Miloshevichi	Typology of the site, the definition of ages, the creation of forest cultures or the reservation for natural renewal, the transition of cutting areas from one district to another	Lack of taxators experience for conducting field surveys	Interaction is sufficient	Promising, operational, targeted	On a mandatory basis, state property, as well as private property for the development of competition and the strengthening of the responsibility of the organization	Possible	Gradually, within 5-7 years	
SEFE Mozyr Experim	No offers	No offers	Yes	Digital technologies will be used	The market is not needed. There must be one	No. They simply do not exist, and if they appear soon	I'm not a supporter	We need to improve our own system

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ental Forestry Enterprise				more widely, the accuracy of taxation will be increased and the cost of forest planning activities will be decreased (I hope)	powerful state organization, equipped with the latest technique and technology. There is a sufficient amount of regulators and inspectors in the state	it's unknown how will they behave. Belgosles exists, they are experienced and qualified specialists with a material base. With regard to the cost of work, then once in 10 years you can lash out		
SPFE Narovlya Special Forestry Enterprise	Determine the exact composition of plantations marked for the commercial cutting		Sufficient	Broader application of satellite systems	RUE Belgosles is enough	No, the specifics of the work	No	Only the experience of the Republic of Belarus
SFE Oktyabr Forestry Enterprise	Division of sub-compartments with the same taxation characteristics, and appointment into cutting by years. Appointment of the second method of gradual cutting, without the 1st	Forest managers are not present in all parts of the forest and there is an incorrect appointment of the activity and the definition of the species because of it	Information from forest managers is poorly received during work	I don't know	The market of services is necessary, for creation of a competition and an opportunity of a choice of the best organization, it is not dependent on ownership	Possible	The market of services can not be formed immediately. It is necessary to purchase equipment, conduct recruitment and training of personnel. Approximately 3	I haven't been anywhere, I have nothing to compare with

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	one. Isolation of 0.1 hectare, which is difficult to determine in nature. Change of the main species. The designation of conversion cut in plantations that do not require cutting						years	
SFE Petrikov Forestry Enterprise			Sufficiently					
Rechitsa Experimental Forestry Enterprise		The poor quality of forest planning, due to the low % of work performed using measuring methods, and the excessive use of approximate measurements, the lack of modern software for the development of forest planning	Sufficiently	More equipped with modern equipment, experienced, using advanced technologies, including the use of online surveillance and forest monitoring systems	Yes, it is necessary, the number of organizations will determine market relations, the form of ownership doesn't affect the quality of work	It is possible, provided they are sufficiently qualified.	Immediately, with the establishment of specific terms for the transition to market relations	The Republic of Belarus

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		projects						
SFE Rogachev Forestry Enterprise					No. When selecting an organization for forest planning, one of the main factors will be the cost of the work performed, resulting in a high probability of reducing the quality of forest planning. Considering that the forest planning is carried out for a long audit period, this can significantly complicate the work of the forestry establishment			
SFE Svetlogorsk Forestry Enterprise	No offers	No offers	Yes, to a sufficient extent	Forest planning with implementation of outfalls for main use	Yes, it is necessary, state ownership, in each SPFE, which, perhaps,	It is possible, but in the presence of such, the development of deliberate	Only gradually, begin with doing it in any of the SPFE (paragraph 11), and develop for 2-3	Only the experience of our forest managers is suitable, in view of the different

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e					will reduce the cost of forest planning works	understatement of volumes, dubious data on the state fund (errors, inaccuracies in forest inventory) are possible	years, in order to identify all the weaknesses and difficulties in the creation of such services, and then gradually introduce it into each SPFE	climatic and geographic conditions of different countries
SFE Khoynik Forestry Enterprise			To an adequate degree		Form of ownership - state-owned, services - fee-based	No	Is not a supporter	Finland, Poland
Chechersk Special Forestry Enterprise	The problems did not arise	Non-compliance of the planned activities	Organized enough	More precise methods of processing forest planning materials	The service market is necessary, private organizations should work on equal terms with state enterprises, so competition will develop, and consequently the quality of forest planning works	It is possible, if it is fixed at the legislative level	Gradually, within 3-4 years	We are not acquainted with the experience of forest planning in other countries
Grodno SPFE								
SFE Volkovysk	The change in the composition of plantations for	Accuracy of taxation	Sufficient	In connection with the occurring strong	Yes, the number of organizations so that there is	Yes	Gradually, three years, because it takes time to select	

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Forestry Enterprise	cutting of the main use, which leads to a discrepancy between the volume of the calculated cutting area by species and by years; considerable discrepancy of the area of sub-compartments; design of non-continuous cutting of main use for pine farming in rich types of forest (C2/kis).			changes forest planning should be continuous	competition, but without loss of quality of work		personnel and assess the quality of the work performed	
SFE Grodno Forestry Enterprise	The problems were not identified	During forest planning it is necessary to plan measures to optimize the age structure of forests, to enumerate forest roads and map them	The interaction of the forestry industry with the forest planning organization is well established	High-tech branch of knowledge based on advanced scientific developments in the field of forest inventory	The market of forest planning services in the republic is necessary, it should work with organizations of both private and state forms of ownership, this will create	Forest planning by private organizations is possible	The market of forest planning services should be formed at a time after the creation of an appropriate legal framework	In the conditions of Belarus, the experience of Poland is the most relevant, as our countries are close in terms of the growth of plantations, as well as the set of socioeconomic

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					competition in the market of forest planning services, which will allow reducing the cost of work and reducing costs from the state budget			indicators
SFE Dyatlov Forestry Enterprise		There are no problematic issues in the existing system of organization of forest planning works. The suggestion is that the forest management plan should have the status of a recommendatory nature, it should be possible to make major amendments in the field in specific conditions without any coordination	Yes		The market of forest planning services is necessary. The number of organizations and the form of ownership does not matter. When there is competition, this will affect the quality of forest planning, and in turn the cost of forest planning works	Yes. The form of ownership does not affect the quality of work, the main thing is that these works are performed by qualified specialists	The timing of the formation of the market for forest planning services does not play a special role. The main thing is competition. The earlier the better	
SFE Iyve	Point 6.5.1 of	Sometimes poor	To a sufficient		No	The state		Poland

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Forestry Enterprise	TCEP 377-2012 "Rules for forest planning of forest fund" Dry wood, dirtiness, single trees can significantly affect the assignment of plantations to soil groups and the definition of the prevailing species are not considered in determining the taxation indicators	quality forestry management activities are identified, which has a significant effect on the forestry activities of the forestry enterprise (sub-compartments planned for the cutting when changing the prevailing species can not go for cutting, etc.)	degree			organization should be engaged in basic forest planning. Some types of work (withdrawal of timber cutting areas, continuous forest planning) can be carried out by private forestry organizations with experience in this area		
SFE Lida Forestry Enterprise	Difficult to answer	As a rule, if forest cultures were not created, the boundaries of sub-compartments in the quarter are blurred in kind, and on the tablets are indicated in a specific place. Hence, there is a need to shoot cutting areas. Proceeding from	The interaction is organized sufficiently	It is necessary to send an annual forest planning team specialist to the forestry enterprise to coordinate the introduction of current changes in the forest management with the coordination of data on the activities carried	Yes, it is necessary. The forestry enterprise should be able to choose when and which forest planning organizations to attract. At the same time, forest planning organizations should bear personal	Yes. The law of the market will work - the absence of monopoly. Each organization will strive to provide its services more qualitatively, cheaper and in a timely manner	3-5 years. It takes time to acquire and develop both material and intellectual base. Everything will become possible with the specific profitability of the organizations themselves	Poland, Finland, Canada

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		this, it is necessary, in the case of forest planning, to unite the sub-compartments not differing by 2 units of composition into a single sub-compartment, with the same main species, up to 0.2 by volume inclusive and within 10 years for coniferous and 5 deciduous areas. Also, not to allocate sub-compartments up to 0.5 hectares in separate areas, unless this is absolutely necessary		out and the seized-accepted land with the land services and conservation services. At the same time, there will be an opportunity to specify inaccuracies in the forest planning. The volume of non-compliance acts will decrease.	responsibility in identifying violations and inaccuracies that caused material damage			
SFE Novogrudok Forestry Enterprise	The discrepancy between the area of allocations and the materials of the forest inventory, which	There are no problematic issues in the existing system of organization of forest planning	The interaction of our forestry enterprise with the 2nd Minsk forest planning expedition of RUE "Belgosles"	Forest planning should be advisory. Project sheets and volumes should be approved in	Yes. The number of organizations and the form of ownership does not matter. The main task and	Yes. The form of ownership does not affect the quality of forest planning, provided that the forest planning is	The timing of the formation of the market for forest planning services does not play a special role. Given	Difficult to answer

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	leads to the failure to fulfill the projected volumes of cutting by the area, in this connection, it is necessary to exclude the cutting subdivision for cutting-back and thinning. The change in the composition of plantations for commercial cutting is a serious problem for the development of the calculated cutting area in the context of enterprises and forest groups. Design of not solid commercial cutting - the set does not correspond to the		is well established, if necessary, we provide assistance and advice on emerging issues	general for the audit period, and not for years	condition should be the quality of forest planning	carried out by qualified specialists	the selection of qualified personnel - the earlier, the better	

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	actual characteristics and indicators for cutting. The volume should not be planned in thousand cubic meters, but by the area and the method of cutting must be appointed by the enterprise itself							
SFE Novogrudok Forestry Enterprise		In carrying out basic forest planning, significant errors affecting all the economic activities of the enterprise can be laid down, mistakes in the main species can exclude significant areas from the estimated cutting area. The underestimated volume of the plantation and the	Interaction is sufficient	Operative carrying out of taxation of the accepted lands	It is not necessary	No		Lithuania, Poland

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		intensity of cutting during full-scale survey, exclude full coverage of all areas						
SFE Skidel Forestry Enterprise	No	No	No		Forest planning services should be in the form of one organization with the presence of regional branches of state property	No	It is viable to use the formed and currently functioning forest planning services	
SFE Slonim Forestry Enterprise		In our opinion, there are no problematic issues in the existing system of organization of forest planning works. However, it would be desirable, that the forest management plan would have a recommendation status, on the sites, taking into account the reality, it would be possible to	Yes	Forest planning should be continuous. This will increase the control over the quality of work	It is not necessary	No		

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		make minor changes in specific conditions without approvals						
SFE Slonim Experimental Forestry Enterprise	Difficult to answer	In carrying out basic forest planning, significant errors affecting all the economic activities of the enterprise can be laid down, mistakes in the main species can exclude significant areas from the estimated cutting area. The underestimated volume of the plantation and the intensity of cutting during full-scale survey, exclude full coverage of all areas	Interaction is sufficient	Along with the basic one, continuous forest planning is also carried out, with the provision of assistance by the forest manager in off-bearings, the prompt conduct of the taxation of the land taken and the coordination with the land administration services of the districts	With a state form of forest ownership, a state company should be engaged in forest planning. Separate types of taxation of cutting areas can be carried out by companies, that have employees of appropriate qualifications, on a contractual basis	No		Poland, Sweden, Finland
SFE Schuchin Forestry Enterprise	The problems were not identified	It is necessary to plan measures to optimize the age structure of forests	The interaction of the forestry enterprise with the forest planning	A high-tech branch of knowledge based on	The market of forest planning services in the republic is	Forest planning by private organizations is possible	The market of forest planning services should be formed at a time	In the conditions of Belarus, the experience of Poland is the most

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e		during forest planning	organization is well established	advanced scientific developments in the field of forest inventory	necessary, it should work with organizations of both private and state forms of ownership, this will create competition in the market of forest planning services, which will allow reducing the cost of work and reducing costs from the state budget		after the creation of an appropriate legal framework	relevant, as our countries are close in terms of the growth of plantations, as well as the set of socioeconomic indicators
Minsk SPFE								
SFE Berezino Forestry Enterprise	No specific examples available	There are no remarks	Yes	Conducting a forest inventory using high-precision tools, instruments and equipment, high-resolution spectra-zonal aerial photographs and geoinformation technologies	No, since forests are in state ownership and a unified state policy in the field of forest planning is conducted	No	No	I'm not acquainted with the experience in the field of forest planning in other countries
SEFE	No specific	There are no	Yes	Conducting a	No, since forests	No	No	I'm not acquainted

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Borisov Experimental Forestry Enterprise	examples available	remarks		forest inventory using high-precision tools, instruments and equipment, high-resolution spectra-zonal aerial photographs and geoinformation technologies	are in state ownership and a unified state policy in the field of forest planning is conducted			with the experience in the field of forest planning in other countries
SEFE Borovlyany Special Forestry Enterprise	No specific examples available	There are no remarks	The interaction of the forestry enterprise with the forest planning is organized at the proper level	Conducting forest planning using modern instruments and geoinformation technologies	Yes. The number can be different, for more fair competition, the organization ordering the work had a choice. Private ownership: due to the fact that it can administer the work of the object better than the state structures; have greater freedom of action; are interested to generate income	Yes	The deadline can be different, the main thing is that their quantity corresponds to the quality of the forest planning services carried out	I'm not acquainted with the experience in the field of forest planning in other countries

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					that motivates private organizations to work more efficiently			
SEFE Vileyka Experimental Forestry Enterprise	No specific examples available	There are no remarks	The interaction of the forestry enterprise with the forest planning is organized at the proper level	Conducting forest planning using modern instruments and geoinformation technologies	Difficult to answer	Difficult to answer	No	I'm not acquainted with the experience in the field of forest planning in other countries
SFE Volozhin Forestry Enterprise	There are no examples, since the forestry enterprise does not deal with forest planning, at the same time it is seen that insufficient attention is paid to preparatory work for forest planning	No, since the forestry enterprise does not deal with forest planning	To a sufficient extent	Conducting a forest planning using high-precision tools, instruments and equipment, high-resolution spectrozonal aerial photographs and geo-information technologies and real performance rate for a taxator	No, since forests are in state ownership and a unified state policy in the field of forest planning is conducted	No, since inventory, forest fund accounting and forest planning should be conducted by experienced highly skilled specialists using modern technology, instruments and tools that have access to geoinformation technologies	No	According to the conditions of Belarus in modern conditions the experience of the Republic of Poland is preferable
SFE Kletsk Forestry	I see no problematic issues	The only problem is that all the supervisory	The interaction of our forestry enterprise with the	Forest planning of the future ??? We had better	The market of forest planning services ??? How	Refer to the previous answer	I consider this unnecessary.	Of course Finland, as well as Germany,

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Enterprise		authorities take forest planning data for an unconditional basis, while forest managers are also prone to make mistakes	forest planning organization is sufficiently organized	survive today!!!	large is Belarus?			Spain and Italy
Kopyl Experimental Forestry Enterprise	Difficult to answer	Assignment of cutting in the age limit at the time of forest planning and losing relevance after receipt of materials	I think yes	Difficult to answer	Unlimited number of any form of ownership. The number of companies and organizations will adjust the market	Possible, if they exist	Gradually in a few years. It is necessary to create a legislative base	Difficult to answer
SFE Krupki Forestry Enterprise			Interaction is sufficient	The forest planning project should be of an advisory nature	A forest planning should be conducted by a state organization	No	No	Perhaps Finnish
SFE Logoyisk Forestry Enterprise	The issue of transfer of areas for admitting light, isolation and cutting by the forest planning, respectively, into isolation, cutting	Difficulty of removing cutting areas designated for cutting and their development in plantations that have undergone changes in taxation	Yes	Continuous, operational	No	No		Finland

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	and advance thinning is not regulated	characteristics during the revision period						
SFE Luban Forestry Enterprise	Specific examples on problematic issues of application of existing forest planning documents in practice are not available	Difficult to answer	The interaction of the forestry enterprise with the forest planning is organized at the sufficient level	Conducting a forest inventory with the use of modern high-precision instruments and geoinformation technologies	The market of forest planning services in Belarus is necessary to create competition and, accordingly, to improve the quality of forest works	This question is difficult to answer	No	I'm not acquainted with the experience in the field of forest planning in other countries
Minsk Forestry Enterprise	No specific examples available	No remarks	The interaction of the forestry enterprise with the forest planning entity is organized at the sufficient level	Conducting a forest inventory with the use of modern high-precision instruments and geoinformation technologies	This question is difficult to answer	No suggestions on this subject	No	I'm not acquainted with the experience in the field of forest planning in other countries
SFE Molodechno Forestry Enterprise	Types of cleaning cutting are determined at the time of field (forest inventory) works, which is the reason for the inconsistency of	When establishing the type of cleaning cutting take the actual age of the plantation for the age of the plantation taking into account the			It is necessary			

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	the type of cutting at the time of entering of forest management plan into operation. The division of cleaning cutting in young growth into additional types of cutting, as well as the separation of cleaning cuttings into cutting-back and advance thinning with this establishment of the type of cutting and rounding of the age of the plantation, is the reason for the discrepancy between the estimated cutting area	time required for the implementation of the forest planning project. Define the types of cutting in the plantations: admitting light, (combining admitting light and isolation) cutting-back (combining cutting-back and transit)						
SFE Pukhovich Forestry Enterprise			Yes		Yes, state companies. A centralized system is required	No		

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e								
SFE Slutsk Forestry Enterprise	No	Loss of the relevance of forest planning in connection with the sharp changes in the forest fund that have become more frequent in recent years	Yes	Continuous	Yes, the maximum possible, different forms of ownership	Yes	As soon as possible	Don't know
SFE Smolevichi Forestry Enterprise	Why there is the description (KPPD) and (PKP) if they are not used in the forestry industries. For this method of taxation, even an evaluation can not be made in the Automated Workstation. Assortment tables are not present. At the PKP only by F. P. Moiseenko	The main reasons are observed in the inconsistency of the composition and the growing stock, the age line is not specified correctly, which in turn leads to a further inadequate definition of the economic section	Interaction is successful and prompt	Automated forest planning system				In the case of off-bearing by selective taxation, it is necessary to rely on such countries as Poland, Finland and others
SFE Starobin Forestry Enterprise	I find it difficult to answer this issue	No remarks	The interaction of the forestry enterprise with the forest planning	Conducting a forest planning using modern high-precision	I have no specific proposals on this issue	I find it difficult to answer this issue	No	I'm not acquainted with the experience in the field of forest

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e			entity is organized at the proper level	instruments and geo-information technologies				planning in other countries
SFE Stolbtsy Forestry Enterprise	No examples	No issues	Yes	Conducting forest planning using space imagery	No	No. Forest planning should be performed by highly qualified specialists that use modern technology and have access to information from satellites		I'm not acquainted with the experience of other countries
SFE Uzda Forestry Enterprise	Determination of boundaries and areas of forest fund plots, inventory of the forest fund with the definition of species and age composition of forests	The most qualitative conducting of field forest planning works, close work with forest managers for all existing activities	In terms of coordinating the activities planned by the forestry enterprise, according to the current legislation, there are no issues	The most qualitative conducting of field forest planning works, close work with forest managers for all existing activities	No	No	No	Germany
Mogilev SPFE								
SFE Belynichy Forestry Enterprise	No	The lack of coordination of forest fund areas with information protection system data, a complex procedure for	Sufficient			I consider it possible	Depends on the demand for such services	Difficult to answer

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		introducing changes in the forest management plan , planned activities						
SFE Byhov Forestry Enterprise	Difficult to answer	Difficult to answer	The degree of interaction of the forestry enterprise with the forest planning organization is sufficient for the work of the forestry enterprise	Difficult to answer	Yes. Form of ownership does not matter	Possible	Gradually, after the training of highly qualified specialists, the development of the practice of conducting field forest planning works	Have no information
SFE Gluski Forestry Enterprise			To a sufficient degree	Conduct forest planning according to existing rules. But higher accuracy of taxation is necessary	A state-owned market of services is needed	The forest planning organization must be state-owned		
SFE Goretzki Forestry Enterprise		It is not fully possible to monitor the work of taxators. Often, taxation cards are filled according to the data of the previous forest	Sufficient	A single database related to GIS and AWP based on modern technologies	Yes, it is necessary. The form of ownership is private, as the practice shows only a person interested in	Yes, it is possible	Gradually, within 5 years. Since it is not possible to form a qualitative and competitive market for forest planning works immediately	

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		planning without taking into account the current changes, which is not true			making a profit can provide a quality service. Number of organizations - no less than 5			
SFE Klimovich Forestry Enterprise	No offers	No offers	There are no comments on interaction with forest planning organizations	More precise in terms of quality of taxation and operational when making current changes in the implementation of forest planning activities, based on modern space and information technology	Yes. At least 3. The form of ownership is not important - the main factors are cost and quality of the works performed, as well as the possibility of demand from the forest planning organization for poor quality of work	Yes	Gradually. Due to competition between private and state forest planning organizations	No offers
SFE Klichev Forestry Enterprise	No	No	Sufficient		I don't think so	No. Specialists with experience, an organization with a good material base are required for the implementation of forest planning		
SFE Kostyuk	No	No	No	Use of modern earth remote	No	It is possible. The function of the	No	In our country, special

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ovichi Forestry Enterprise				sensing satellites to obtain high resolution images for continuous forest planning. Increasing the efficiency of production of forest services is impossible without a purposeful work on the development of new technological processes based on the latest scientific achievements. The development and implementation of innovative methods in the sphere of forest taxation will significantly		author's supervision should be left for state forest managers		technologies, principles, methods of forest planning in accordance with forest and vegetation conditions and with our approach of using forest resources, the potential of people and technology have been developed. Based on the existing base, it is necessary to introduce new approaches and methods of forest planning using the experience of other European forest countries such as Finland, Germany, Poland

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				increase the scope of work, the speed of data processing and the production of output materials. It is necessary that the introduction of new technologies and applied methods of forest planning will take place without paper chase				
SFE Krasnopolye Forestry Enterprise			Sufficient	Automated workstation of the taxator. Forest taxation with the use of laser location and spectrozonal aerial survey, which allows to obtain full-value taxation indicators, which allow to		Possible		

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				create forest maps in 3D mode				
SFE Mogilev Forestry Enterprise	There is a problem of applying the current regulatory and technical documents on the regulation of forest planning in connection with the introduction of the new Forestry Code	The list of soft-leaved young trees planned by the forest management plan for the transfer to the category of economic-value through cleaning cutting includes forest cultures that have been muted by deciduous species and recognized as unsatisfactory by the forest planning, cultures created by the method of corridor renewal, areas with conducted measures for promoting natural renewal, that contradicts the current normative	There are no issues on interaction with forest planning organizations with the forestry enterprise	It would be desirable to think that the technologies of carrying out forest planning works and the technical capabilities of the provided forest planning materials will release legal entities heading forestries from routine work to introduce current changes in them	Currently, the formation of the market for forest services is not relevant, due to the lack of trained and competitive staff	Refer the previous point		The experience of carrying out forest planning in Poland is most suitable for our country due to the common nature of the natural conditions, the comparability of forest areas

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		and technical documents. When appointing cutting for the main use, we consider it advisable: - to appoint plantations for cutting not by years but by five years; - put the plantations for cutting into off-bearing without their crushing, if the area of sub-compartments allows it						
SEFE Osipovich Experimental Forestry Enterprise	It is required to ensure strict control over the filling of taxation cards. The most acceptable is the control when using GLONASS and GPS	There is no proper control over the work of taxators during field work, which allows filling in the taxation cards in the table-top environment	Sufficient	The taxator should have an electronic device with a GPS module and Glonass, into which data of taxation of allotments is recorded with	Yes, it is necessary. The number of organizations may be limited to the scope of work and the availability of taxators	It is possible if they have specialists of the required qualifications. RUE "Belgosles" can also hire individuals under conditions of auctions	In my opinion, this is about 3-5 years, if it concerns private forest planning organizations. Individual entrepreneurs can carry out field work now	No data

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				the possibility of automatic control of the taxed plantation at the time of data entry				
SFE Chaussy Forestry Enterprise	When conducting forest planning, there is a division into a greater number of sub-compartments than in nature (including due to payment to the taxator)	When carrying out field work, taxators should not be involved in several organizations (forestry enterprises of the Republic of Belarus and the Russian Federation), proceed to the next object only after the object under forest planning has been completed	Yes, to a sufficient extent	With better quality of field work, with the introduction of new technologies	State property	There is a risk of poor performance in pursuit of economic benefits	We do not support	We are not acquainted with the experience of other countries. We should develop our own experience, use modern software and computer technologies and the scientific and methodological base, taking into account the specificity of forest planning works, to increase human resources
SFE Cherikov Forestry Enterprise			Sufficient		Yes. At least two forms of ownership - state and private	It is possible	At once. For a possible choice of forest planning organizations for high-quality forest planning	

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SFE Bobruisk Forestry Enterprise			Organized at a good level	Forest management allowing to carry out forestry without performing additional works on taxation of logging areas	Only state form of ownership	In order to exclude the corruption component (financial interest of a certain group of persons), the forest planning organization should be only a state form of ownership		
RUE Belgosles	Compilation and coordination of acts of verification of the accuracy of taxation of sub-compartments in forest planning in accordance with paragraph 5.1.3 of TCEP 060-2006 "Rules for the allocation and taxation of cutting areas in the forests of the Republic of Belarus"	The current system of organization of forest planning works is based on the use of a number of different regulatory documents. If there is valuable field information, there is no modern complex of programs on the new computing platform, which leads to the fact that individual project tables require manual		The development of forest planning is possible in the following areas. 1. Use of modern electronic instruments and tools in the field: - tablet computer in a special version for field conditions, with the possibility of editing forest maps, built-in GPS and other	Forest planning is in fact a part of the system of state forest planning - one of the most important components of general state property. Therefore, the forest planning should be carried out by the state organization, taking into account the fact that the support of the forest	On the example of the Russian Federation, it can be seen that the thoughtless referring of forest planning to the sphere of public services actually led to a loss of control over the state and exploitation of the state's forest resources. At the same time, the existence of so-called competition only exacerbated	The market of forest planning services in terms of forest planning of forest fund is inappropriate. It is possible to form a market for other services close to the profile of forest planning, for example, by transferring of off-bearings and taxation of the cutting fund to the sphere of services	The system of organization of forest planning used in Poland is the most similar in technology of implementation, principles of financing and mentality of application

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		revision		<p>special functions (tablets for field forest planning available for sale are not suitable);</p> <p>- other modern measuring instruments and tools for field work.</p> <p>2. Introduction of programs for automated decoding of digital APS.</p> <p>3. Transition to modern systems of storage and processing of a taxation database.</p> <p>4. Development of the program complex for the preparation of cartographic documents.</p> <p>5. The use of unmanned aerial vehicles and</p>	<p>management plan , including the author's supervision, and the possibility of making changes and additions for 10 years should be provided.</p> <p>There are no guarantees that private organizations will exist for such a period. A unified system for the formation, processing and storage of forest planning databases should also be provided.</p> <p>The market of forest services is in itself possible and can be useful if the main criterion for selecting organizations for</p>	<p>this situation. The experience of the Russian Federation does not allow us to recommend such a perspective. The private forest planning system was not widely used even in Western and Eastern Europe.</p> <p>Therefore, we believe that forest-building works should be handled by narrowly specialized enterprises controlled by the state</p>		

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				remote sensing technologies based on digital space imagery. Improvement of the production-living conditions of field work	forest planning is not primarily the price of works, services (as we do in the vast majority of cases), but the confirmed quality of work. Currently, the decentralization of the market for forest services is possible through the reorganization of RUE "Belgosles", giving the status of independent legal entities to the existing four forestry expeditions and subsidiaries, changing the functions and status of the central apparatus. In any case, the centralization of			

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					administration (or coordination) of forest planning must be preserved			