Funded by Global Environment Facility (GEF)

MINISTRY OF FORESTRY OF THE REPUBLIC OF BELARUS

RUE “BELGOSLES”

BELARUSIAN FORESTRY DEVELOPMENT PROJECT
GEF/THE WORLD BANK
TF0A1173

Approved
Chief Executive Officer
RUE “Belgosles”
_____ A.V. Tarkan

REPORT on Stages № 1-6
under the Contract № BFDP/GEF/SSS/17/30-21/17 dated 31.07.2017
on the Project Activity 3.2.1.1.
Development of the
“Reforestation Management Information System”

Minsk 2019

CONTENTS

LIST OF TABLES 4
LIST OF FIGURES 5
ACRONYMS 6
1 EXECUTIVE SUMMARY 7
2 INTRODUCTION 10
3 GOALS AND OBJECTIVES OF MIS “LESOVOSSTANOVLENIYE” 11
4 MAIN STRUCTURAL DECISIONS 12
4.1 Typical decisions on MIS “Lesovosstanovleniye” functioning 12
5 FUNCTIONS OF THE SYSTEM 13
6 TECHNICAL PROJECT 15
6.1 Compounds of the technical project 15
6.2 Technical decisions 15
7 DATABASE 16
7.1 Database structure 16
7.2 Estimation of data volume 18
8 MIS “LESOVOSSTANOVLENIYE”. ARTIFICIAL REFORESTATION 19
8.1 Functions of the system 19
8.2 Register of reforestation and afforestation areas 19
8.3 Forest plantings plan 20
8.4 Passport of artificial forest stands 23
8.5 Statement to write off forest plantings 24
8.6 Statement on the inspection of assigned for reforestation and afforestation forest fund sites 26
8.7 Report sheet of technical acceptance of forest plantings 28
9 MIS “LESOVOSSTANOVLENIYE”. NATURAL REFORESTATION 30
9.1 Functions of the system 30
9.2 Report sheet of sites assigned for assisted natural reforestation 30
9.3 Report sheet of sites assigned for natural reforestation 31
9.4 Report sheet on technical acceptance of works on natural reforestation assistance 32
9.5 Report sheet on already inspected plots assigned for non-assisted natural reforestation 33
10 MIS “LESOVOSSTANOVLENIYE”. PREPARING REPORTS 35
10.1 Functions of the system 35
10.2 Access and location of the reports 35
11 MIS “LESOVOSSTANOVLENIYE”. INTERACTION WITH THE OTHER INFORMATION SYSTEMS 38
11.1 Interaction with the forest management database 38
11.2 Window “Available sites” 38
11.3 Interaction with “Administrator ISULH” 39
11.4 Interaction with AWP “Lesopol’zovaniye” 42
11.5 Interaction with 1C: Forest management 43
11.6 Interaction with the Multilevel geoinformation system of forestry management of the Republic of Belarus “GIS-Les” 43
12 MIS “LESOVOSSTANOVLENIYE”. SERVER 44
12.1 General provisions 44
12.2 Institutions using MIS “Lesovosstanovleniye” 44
13 TRIAL TESTING OF THE SYSTEM 46
13.1 Time and place 46
13.2 Goals of the trial testing 46
13.3 Testing MIS “Lesovosstanovleniye” functioning 46
13.4 Results of the trial testing 47

13.4.1 Suggestions on the system revision from SEFE “Osipovichskiy opytnyy leshoz”...48
13.4.2 Suggestions on the system revision from SFE “Shchuchinskiy leshoz”.....48
13.4.3 Suggestions on the system revision from SFE “Lepelskiy leshoz” 50
13.5 Results of the trial testing 50
14 SYSTEM REQUIREMENTS 51
14.1 System requirements for user computer 51
15 SUMMARY 52
APPENDIX 1 53
APPENDIX 2 54
APPENDIX 3 55
APPENDIX 4 57
APPENDIX 5 59
APPENDIX 6 61
APPENDIX 7 62
APPENDIX 8 63
APPENDIX 9 64
APPENDIX 10 65
APPENDIX 11 67
APPENDIX 12 68
APPENDIX 13 69
APPENDIX 14 71
APPENDIX 15 73
APPENDIX 16 74
APPENDIX 17 75
APPENDIX 18 76
APPENDIX 19 77
APPENDIX 20 79
APPENDIX 21 80
APPENDIX 22 81
APPENDIX 23 83
APPENDIX 24 85
APPENDIX 25 87
APPENDIX 26 88
APPENDIX 27 89
APPENDIX 28 90
APPENDIX 29 91
APPENDIX 30 92
APPENDIX 31 93

This report was prepared under the Belarus Forestry Development Project with the grant funding support of the Global Environment Facility (GEF).

The findings, interpretations, and conclusions expressed in this report do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent, and the GEF agencies and donors. The World Bank and GEF does not guarantee the accuracy of the data included in this work. The boundaries, colours, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank and GEF concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

LIST OF TABLES

Table 5.1 Functions of MIS “Lesovosstanovleniye”..... **Ошибка! Закладка не определена.**
Table 7.1 List of database tables 16
Table 13.1 Testing system functioning 45

LIST OF FIGURES

Figure 7.1 Setting DB connection using Oracle ..... **Ошибка! Закладка не определена.**
Figure 7.2 Setting DB connection using TCP/IP 18
Figure 8.1 Filter of the window ..... **Ошибка! Закладка не определена.**
Figure 8.2 Register of reforestation and afforestation areas 20
Figure 8.3 Window used to add a site to the register of areas 20
Figure 8.4 Window "Forest plantings plan" (A) 21
Figure 8.5 Window "Forest plantings plan" (B) ..... **Ошибка! Закладка не определена.**
Figure 8.6 Window "Forest plantings plan" (C) ..... **Ошибка! Закладка не определена.**
Figure 8.7 Passport of the stands (A) ..... **Ошибка! Закладка не определена.**
Figure 8.8 Passport of the stands (B) ..... **Ошибка! Закладка не определена.**
Figure 8.9 List of sites in the Statements to write off dead forest plantings**Ошибка! Закладка не опреде**
Figure 8.10 Tab "Site" in the window “Statement to write off dead forest plantings”**Ошибка! Закладка н**
Figure 8.11 Tab "Site" in the window "Statement to write plantings, which died from natural disasters" ..... **Ошибка! Закладка не определена.**
Figure 8.12 Statement on the inspection of forest fund (A) .... **Ошибка! Закладка не определена.**
Figure 8.13 Statement on the inspection of forest fund (B) .... **Ошибка! Закладка не определена.**
Figure 8.14 Report sheet on technical acceptance of forest plantings**Ошибка! Закладка не определена.**
Figure 9.1 Report sheet of sites assigned for assisted natural reforestation. Tab "List of sites" 30
Figure 9.2 Report sheet of sites assigned for assisted natural reforestation. Tab "Site" 31
Figure 9.3 The Report sheet of sites assigned for natural reforestation 31
Figure 9.4 Report sheet on technical acceptance of works on natural reforestation assistance. Tab "Site" ..... **Ошибка! Закладка не определена.**
Figure 9.5 Report sheet on already inspected plots assigned for non-assisted natural reforestation. Tab "Site" ..... **Ошибка! Закладка не определена.**
Figure 10.1 Location of the Aggregated forest plantings report**Ошибка! Закладка не определена.**
Figure 10.2 Location of the "Data" type reports ..... **Ошибка! Закладка не определена.**
Figure 10.3 Location of the "Report" type reports ..... **Ошибка! Закладка не определена.**
Figure 10.4 Window of preparation of aggregated report in MS Excel**Ошибка! Закладка не определен**
Figure 10.5 Data processing in MS Excel ..... **Ошибка! Закладка не определена.**
Figure 11.1 Window "Available sites" ..... **Ошибка! Закладка не определена.**
Figure 11.2 Updating MIS "Lesovosstanovleniye" ..... **Ошибка! Закладка не определена.**
Figure 11.3 Importing the database of MIS "Lesovosstanovleniye"**Ошибка! Закладка не определена.**
Figure 11.4 Creating the database of MIS "Lesovosstanovleniye"**Ошибка! Закладка не определена.**
Figure 11.5 Deleting the database of MIS "Lesovosstanovleniye" 40
Figure 11.6 Controlling the database of MIS "Lesovosstanovleniye" 40
Figure 11.7 Exporting the database of MIS "Lesovosstanovleniye" 41
Figure 11.8 Window "Record on afforestation and afforestation areas" 41
Figure 12.1 Export of primary reports ..... **Ошибка! Закладка не определена.**
Figure 12.2 Scheme of data exchange between institutions using MIS “Lesovosstanovleniye” 44

ACRONYMS

MIS	Management Information System
AWP	automated workplace
DB	database
DBMS	Database management system
GIS	Geographic Information System
OS	Operating system
RUE	Republican Unitary Enterprise
SPFA	State Production Forestry Association
SFE	State Forestry Enterprise
SEFE	State Experimental Forestry Enterprise
TSC	Type of soil conditions
TCP	Transmission Control Protocol
IP	Internet Protocol

1 EXECUTIVE SUMMARY

Work on development of an information management system (hereinafter referred to as IMS) “Reforestation” was carried out under contract No. BFDP/GEF/SSS/17/30-21/17 in accordance with the stages of developing automated systems established by GOST 34.601.90 “Information Technology. Set of Standards for Automated Systems. Automated Systems. Stages of Development”.

Currently in the forestry institutions of the Republic of Belarus all primary accounting documentation related to reforestation and afforestation is filled out in printed format, and the reporting and consolidated documents are filled out and calculated manually (the legislation of the Republic of Belarus stipulates working out and keeping 31 documents related to reforestation and afforestation). The IMS “Reforestation” software was developed to increase the efficiency of afforestation and reforestation, to eliminate errors when working out reporting documentation as well as to introduce automation of planning reforestation and afforestation.

The database for IMS “Reforestation” was developed under Contract No. BFDP/GEF /SSS/17/30-21/17. The database management system used in the IMS “Reforestation” is Oracle Database 11XE. The Oracle Database Express Edition was selected taking into account decentralized data storage and low database management system (DBMS) load.

The connection to the DBMS is implemented using the TCP / IP protocol in the IMS “Reforestation” allowing to centralize storage on one database or, through an Oracle client, to use its own DBMS. The IMS “Reforestation” database contains over forty interrelated tables.

The following main functions are implemented in the IMS “Reforestation”:

1. Formation of electronic documents with their further storage in the database;
2. Hierarchical attachment of documents to the reforestation and afforestation plot;

   This allows to elaborate documents in strict compliance with the technological process of reforestation and afforestation (from designing a reforestation site to transferring the site to forested lands).
3. Export of documents to Excel or Word for printing out;
4. Separation, association or renaming of the numbering of a reforestation and afforestation plot;
5. Automatic filling out of attribute data based on previously filled out documents;
6. Filling out most attributes according to the developed reference-books and guidelines.

Electronic documents are generated automatically according to the production processes of forest restoration and afforestation. The output forms of the generated documents correspond to the respective forms approved by Resolution No. 80 of the Ministry of Forestry of the Republic of Belarus dated December 19, 2016 “On some issues of forest reproduction in the field of reforestation and afforestation” and TCP 047-2009 (02080).

The document generation algorithm is linked to the reforestation method.

In regard to artificial renewal for generation of electronic documents the following primary documentation was implemented in the IMS “Reforestation”:

1. Register of areas of reforestation and afforestation;
2. Inspection/ survey report;
3. Forest crops project;
4. Statement of technical acceptance of forest crops;
5. Passport of forest crops;
6. Field card for forest crops inventory of Year 1 and Year 3;
7. Field card for transfer of forest crops;
8. Field card for inspection/ survey of forest crops grown on forested lands;

9. Write- off certificate for forest crops that died from natural disasters;
10. Write-off certificate for failed forest crops.

To generate electronic documents in regard to natural regeneration, the following primary documentation is implemented in the IMS “Reforestation”:

1. Register of areas of reforestation and afforestation;
2. List of sites designed for implementation of actions to support natural regeneration;
3. List of sites designated for natural renewal;
4. Data on natural regeneration of forests;
5. Field card of inventory supporting natural renewal;
6. List of inventory sites for natural renewal without support actions.

Automatic generation of consolidated and reporting documents is implemented in the IMS “Reforestation” based on the designed primary documentation for artificial and natural reforestation. Consolidated and reporting documents are generated in Excel or Word files (depending on a document) for further printing out.

Automatic generation is implemented for the following documents:

1. Consolidated forest crops production project;
2. Register of forest crops production;
3. Report on the survival rate of forest crops;
4. Report on transfer of forest crops to forested lands;
5. Consolidated list for entry into the category of valuable plantations created by the method of partial reconstruction and under the forest canopy;
6. Report on entry of forest stands into the category of valuable forest stands;
7. Reforestation report with actions taken to support natural forest regeneration;
8. Register of land accounting with actions taken to support natural regeneration;
9. Consolidated list of transfer of plots with preserved undergrowth to forested lands;
10. Consolidated list of transfer of plots for natural regeneration to the forested lands;
11. Register of natural regeneration of forests.

As for the integration of the IMS “Reforestation” with other information systems, interconnection with the following software products has been implemented:

1. Microsoft Office;
2. GisLes;
3. 1C: Forestry;
4. AWP “Forest Use”;
5. Databank;
6. Administrator of the forestry management information system (hereinafter referred to as FMIS).

Interaction between the IMS “Reforestation” and Microsoft Office is implemented for formatting documents and further printing out.

Interaction between the IMS “Reforestation” and GisLes aims at spatial reference/ link of a reforestation and afforestation plot.

As for interaction between the IMS “Reforestation” and 1C: Forestry, the IMS “Reforestation” can export attribute data of primary, consolidated and reporting documentation in XML format for further use in the 1C: Forestry software.

The IMS “Reforestation” makes it possible to use data from the AWP “Forest Use” as well as the databank of the RUE “Belgosles”. The joint use of these databases in the IMS “Reforestation” allows to form a sample of perspective sites for the following reforestation and afforestation activities at these sites (the “Perspective sites” form).

The server part of the IMS “Reforestation” is integrated with the FMIS software (with the AWP “Forest Use”). The “Administrator of FMIS” software helps manage the IMS “Reforestation” database, update the IMS “Reforestation” application as well as export database data to the required formats.

The option to store the IMS “Reforestation” data on the central server of the RUE “Belgosles” was implemented.

For in-depth testing of the developed software, a pilot operation of the IMS “Reforestation” was conducted in three forestries: SFI “Shchuchinsky forestry”, SFI “Lepelsky forestry”, SFI “Osipovichsky experimental forestry”.

Within the pilot operation of the IMS “Reforestation” in three state forest institutions, all primary documents related to reforestation and afforestation and worked out as a hard copy from 2012 till 2019 were transferred to the IMS “Reforestation” database. About 70 thousand entries were filled out in the database for each of the above-mentioned forestries during the trial operation of the IMS “Reforestation”. Thus, after completion of the pilot operation, these forestry institutions entered all the documents related to reforestation and afforestation for the period of 2012-2019.

Based on the results of the pilot operation, the commission for pilot operation concluded that the IMS “Reforestation” could be put into operation.

2 INTRODUCTION

Currently there are several forest fund inventory and management systems with different content and functions in the Republic of Belarus. As the current system of reforestation inventory is rather complex and labour intensive, there is a need to automate some data collection and analysis processes, preparation of aggregated reports (required for management decisions and for fast analysis of forestry situations). Furthermore, lately the area of lands in need of reforestation and afforestation and the area of lands where such activities have already been conducted has enlarged greatly.

Currently, there are several software products that interact with each other in the forestry sphere of the Republic of Belarus:

- AWP "Lesopol'zovaniye" automates financial estimation of cuttings, issue of permissions for forest cutting, preparation of agricultural reports;
- AWP "Otchyotnost' predpriyatiya" automates providing of statistical and departmental data;
- 1C: Lesnoye hozyajstvo is a software for collection and analysis of data on financial and economic activities of forestry enterprises;
- Multilevel geoinformation system of forest management (GIS-Les) provides spatial analysis of forest management activities data;
- Data bank "Lesnoy fond Respubliki Belarus'" stores and provides data about forest sites.

The experience of the creation of these software products is taken into account during the development of the new system.

MIS "Lesovosstanovleniye" will directly interact with:

- AWP "Lesopol'zovaniye" (import of plots assigned for reforestation)
- AWP "Otchyotnost' predpriyatiya" (preparation of statistical and departmental records)
- 1C: Forest management (collection and analysis of data about financial costs of reforestation and afforestation)
- GIS-Les (spatial analysis of data about location of forest plots)
- data bank "Lesnoy fond Respubliki Belarus' (provision of complete information about the results of forest fund inventory in order to find plots where reforestation activities have been conducted and where such activities can be conducted with prescribed methods).

The results of the work on MIS "Lesovosstanovleniye" development will be:

- Creation of a single database containing data about plots where reforestation and afforestation activities are available or have already been conducted.
- Tracking activities in plots where reforestation and afforestation activities are available or have already been conducted.
- Simplification and optimization of such plots inventory process.

Forest management institutions will be able to prepare records (such as forest planting plans, passports of forest plantings) in digital window. Such data will be connected to a specific forest site according to its spatial location. The data will be available for export to XML for 1C: Forest management and for printing (using MS Word). Detailed data about every reforestation and afforestation plot (forest structure and type, type of soil conditions, number of seedlings etc.) will be stored in a database (Oracle XE). Records on forest plantings maintenance activities conducted will be stored in the window called "Passport of artificial forest stands"

Organizations which manage forest activities will be able to get data for every site or general data about reforestation area by years and by species, by the type of creation of forest cultures (artificial, natural, assisted natural); data about conducted forest management activities and dynamics of forest plantings survival rate.

3 GOALS AND OBJECTIVES OF MIS “LESOVOSSTANOVLENIYE”

The main goal of MIS “Lesovosstanovleniye” development is to simplify the system of records and to systematize reforestation and afforestation data.

MIS “Lesovosstanovleniye” will allow users to systematize reforestation and afforestation data, store digital records, more effectively control forest plantings. The legislation, inventory methods and systems and general reports needed for management and strategy decisions have been investigated while planning the system.

In order to achieve the goals MIS “Lesovosstanovleniye” should be able to perform the following tasks:

- Store data about forest plantings of the forestry enterprise, allow to correct the data;
- Export database to a local storage or to the central server through internet;
- Provide general information about reforestation areas by years and by various species;
- Inventory areas by type of creation of forest plantings (artificial, natural, assisted natural);
- Synchronize database with the central server through internet;
- Detect plots assigned for reforestation and provide information about their area and type of forest land;
- Import information about forest sites assigned for reforestation from AWP “Lesopol’zovaniye” and forest management data from data bank “Lesnoy fond Respubliki Belarus’”;
- Store, export/import and print digital records (such as forest planting plans, passports of forest plantings), which are connected to a certain forest site;
- Store detailed data about reforestation and afforestation activities (forest structure and type, type of soil conditions, number of seedlings etc.) for every plot;
- Store data about conducted forest management activities and dynamics of forest plantings survival rate;
- Store cartographic data.

Thereby, specialized MIS should be developed for all of the following forest management institutions:

- Forestry, forestry enterprise (provide automated storage of records about reforestation and afforestation);
- SPFA, Ministry of Forestry (manage reforestation and afforestation processes at region and national level);
- RUE “Belgosles” (store data in the central database, provide aggregated data, reports and perform management functions).

4 MAIN STRUCTURAL DECISIONS

4.1 Typical decisions on MIS “Lesovosstanovleniye” functioning

The following was used for the system development:

- Agile software development method;
- RUP method for database development;
- XML for data transfer between sub-systems;
- User interface recommended by Microsoft.
- MS Excel and MS Word for document export and printing.

5 FUNCTIONS OF THE SYSTEM

The system will consist of the following sub-systems:

- Input sub-system;
- Storage and managing sub-system;
- Reference data sub-system;
- Data processing sub-system;
- Output sub-system.

Each sub-system must be able to complete the specified number of functions and interact with other sub-systems. Functions of every sub-system are listed in Table 1.

Table 5.1 Functions of MIS “Lesovosstanovleniye”

Sub-system	Functions
Input	convert input data to a readable for MIS
	show all the data about forest site related to reforestation
	input and edit attributive data
	logical control of input data accuracy
Storage and managing	prepare attributive, objective and reference tables
	correlate attributive data and reference tables
	provide data independence at physical and logical level
	store data in digital window
	provide integrity of the database, exclude redundancy and duplication
	effectively export data for its further processing
	make reserve copies and restore the database to other storages
Reference data	create and edit all the classifiers of the database used for database object coding;
	create and edit libraries used by MIS “Lesovosstanovleniye”
Data processing	output data from the database by various search conditions and categories
	output data from the database by inquiries which require special processing
	Process and analyse data stored in the database by specified criteria
Output	output data from the database by various search conditions and categories
	output data from the database by inquiries which require special processing
	Process and analyse data stored in the database by specified criteria
	Prepare inventory documentation about forest cites related to reforestation in text window
	Export/import data to exchange format
	Synchronize data

User will be able to receive primary and aggregated reports in digital window and print them; to receive complete information on every plot of forest fund where reforestation activities are planned or have been conducted, track all forest management activities conducted at the specified plot.

Thus, users will receive data from the database of MIS “Lesovosstanovleniye” in exchange formats which can be used when working with the other software of the forestry sphere.

6 TECHNICAL PROJECT (Stages 1)

6.1 Compounds of the technical project

Technical project consists of the following documentation:

- Explanatory note;
- Hardware description;
- Information database description;
- Task assignment description;
- Software description;
- Classification and coding system description;
- Automated functions description.

Explanatory note describes automated processes, main technical decisions, activities required for software deployment to production.

Hardware description describes required hardware (such as server, PC, working stations connected through the Internet) in detail.

Information database description describes logical and physical structure of the database for every report, describes data location on the specified computers.

Task assignment description describes technological processes, which require automation. Projected system automates the following processes:

- Define plots for reforestation and afforestation;
- Inventory existing reforestation and afforestation plots;
- Record characteristic of plots related to reforestation and afforestation;
- Store and synchronize of data on plots assigned for reforestation and afforestation;
- Prepare and store documentation related to reforestation and afforestation;
- Print required data.
- Software description describes software structure and its functionality;
- Classification and coding system description describes all the reference and normative documents required for system functioning;
- Automated functions description describes sub-systems required for data input and output, describes the data itself.

6.2 Technical decisions

MIS “Lesovosstanovleniye” automates collection of data about areas assigned for reforestation and areas, where forest management activities have been conducted, connects documents and conducted maintenance activities to such areas.

Related to reforestation forest sites contain the following attributive data:

- General data;
- Description of the stands;
- Planned activities;
- Other data.

Thus, the Technical project is developed according to all goals listed in Requirement Specifications, ensures detailed elaboration of all related to reforestation and afforestation processes, defines all required hardware and software, structure of the system and describes all functionalities of the system.

7 DATABASE

7.1 Database structure

MIS “Lesovosstanovleniye” consists of the main table, which contains all the characteristics and tables for each document (Table 7.1). Reports are created with SQL script in the database and exported to MS Excel.

Table 7.1 – List of database tables

Table name	Description
TA_ADD	Table of additions to the plot
TA_ADDITION_PASP	Table of additions to the plot. Passport of artificial forest stands
TA_ALTER_COMP	History of changes in forest square, forest site numeration and changes in their area
TA_BOOK_SQR	Record of reforestation and afforestation areas
TA_CARE_PASP	Table of forest plantings maintenance. Passport of artificial forest stands
TA_DIE_LK	Table of written-off forest plantings;
TA_DIE_LK_DISAST	Table of written-off forest plantings, which died from natural disasters.
TA_DOC_ACT	Documents. Inventory report
TA_DOC_ACT_INV	Inventory report by the forest management plan
TA_DOC_ACT_OPIN	Inventory report by the result of inspection
TA_DOC_NAT	Documents. Report sheet on plots assigned for natural reforestation
TA_EXIST_REG	Report sheet on plots, where assisted natural reforestation activities are planned
TA_INV_NAT_REG	Report sheet on already inspected plots assigned for non-assisted natural reforestation
TA_PASPORT	Documents. Passport of artificial forest stands
TA_PODR	Young growth for natural reforestation. Assistance measures
TA_PROJECT	Forest plantings plan
TA_PROJ_SPEC	Forest plantings plan. Usage of seeding material by species (seedlings/saplings)
TA_REF	Main table of reforestation database
TA_REG_XMER	Planned natural reforestation assistance measures
TA_SURVIVAL_PASP	Table of forest plantings survival rate. Passport of artificial forest stands
TA_TECH_ACCEPT	Report sheet on technical acceptance of works on natural reforestation assistance

TA_TECH_LK	Report sheet on technical acceptance of forest plantings
XSYS_USER	User list
XSYS_VER	Table of database versions

Document tables are directly connected to the main table. Characteristics used in 2 and more documents are located in the main table. Characteristics, which are specific for a single document, are located in special tables of such documents.

User data is stored in RDBMS Oracle Database 11g XE used in all the institutions (forestries, forestry enterprises, central server of RUE “Belgosles”). By default, user connects to the database using RDBMS (Figure 7.1).

Database connection goes through TCP/IP (Figure 7.2) and there is no need to have several RDBMSs in one institution.

Forestries databases synchronize with the database of forestry enterprise. The central server will store aggregated data and reports received from forestry enterprises.

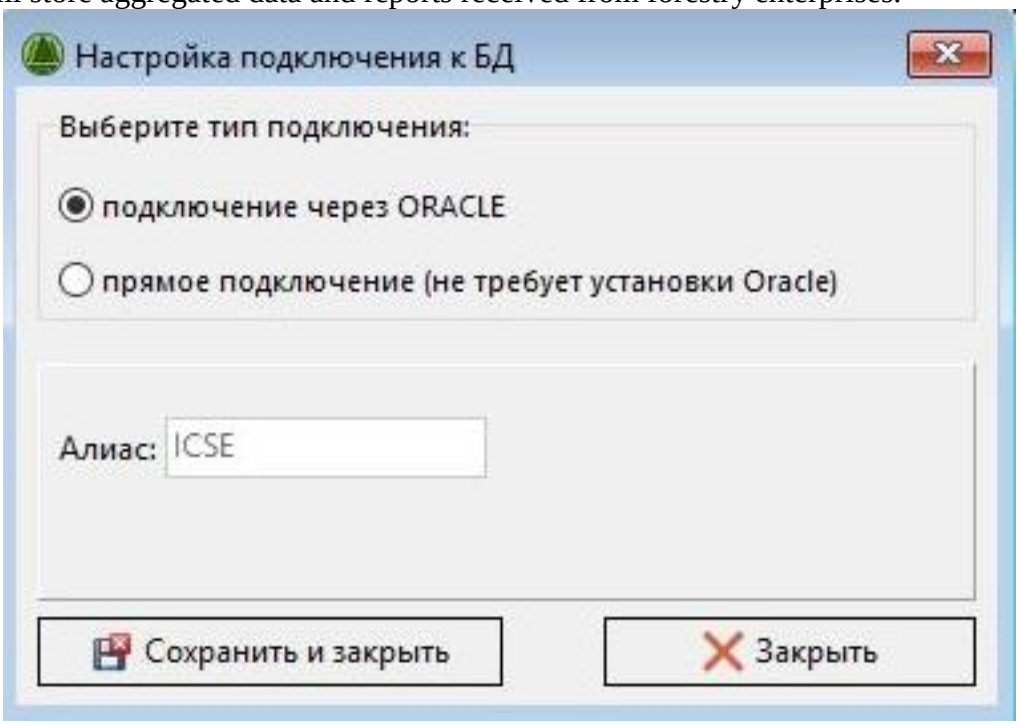


Figure 7.7.1 Setting DB connection using Oracle

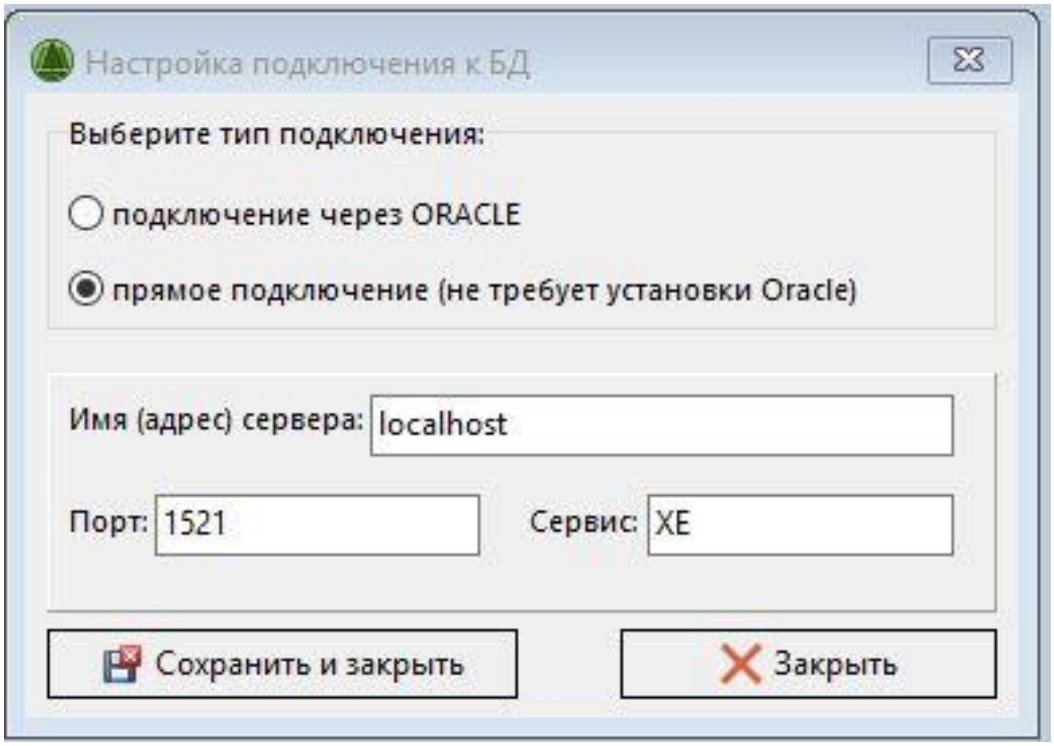


Figure 7.7.2 Setting DB connection using TCP/IP

7.2 Estimation of data volume

Approximate volume of the central database (forestry enterprise level) of MIS “Lesovosstanovleniye” is 500 plots (about 15 Mb) a year.

The central server receives only reports, their approximate volume is about 10Mb a year.

8 MIS “LESOVOSSTANOVLENIYE”. ARTIFICIAL REFORESTATION (Stages 2)

8.1 Functions of the system

MIS “Lesovosstanovleniye” (artificial reforestation) contains windows of the following documents:

1. Register of areas of reforestation and afforestation;
2. Inspection/ survey report on forest fund designated for reforestation and afforestation;
3. Forest crops project;
4. Statement of technical acceptance of forest crops;
5. Passport of artificial planting of forest crops;
6. Field card for forest crops inventory of Year 1 and Year 3;
7. Field card for forest crops inventory of Year 7;
8. Field card for the survey of forest crop areas on forested lands transferred to another group of crops based on cultivated tree species;
9. Write- off certificate for forest crops that died from natural disasters;
10. Write-off certificate for failed forest crops.

Every document has specified columns which have their own values. The most possible number of columns is filled automatically. Menus are well-organized for comfortable navigation among forest fund sites.

The system filters sites by year when filling a window, filters sites by forestry or forestry enterprise. At the same time, there is possibility to filter a site by single column attributes in tables (Figure 8.1).

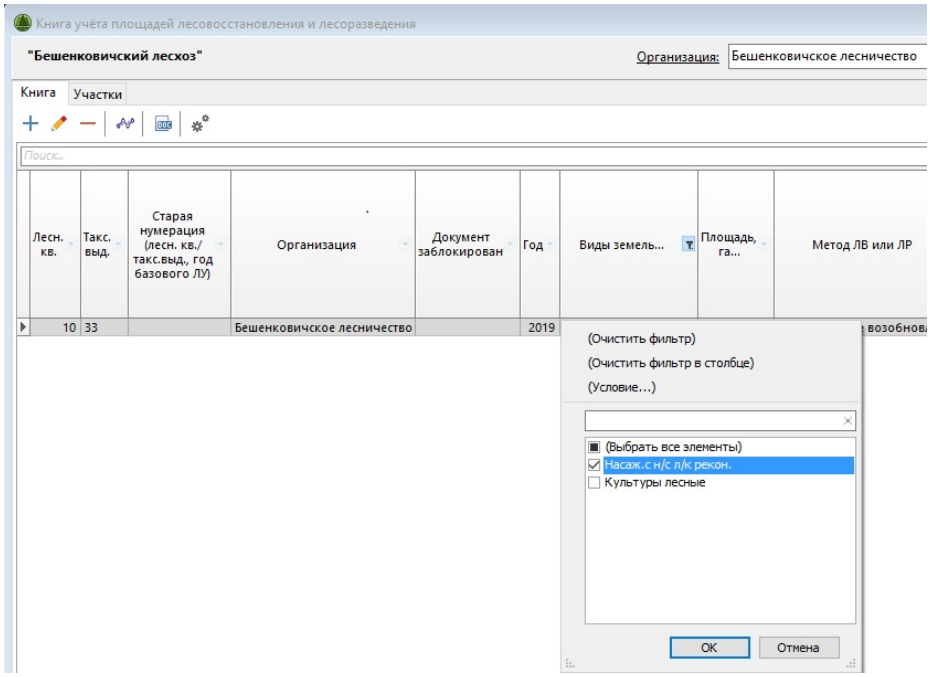


Figure 8.1 Filter of the window

8.2 Register of reforestation and afforestation areas

The Register of reforestation and afforestation areas has two tabs: “List of sites” and “Site” (Figures 8.2, 8.3). The printed form of the document is presented in the appendix 1.

The document contains sites assigned for reforestation and afforestation.

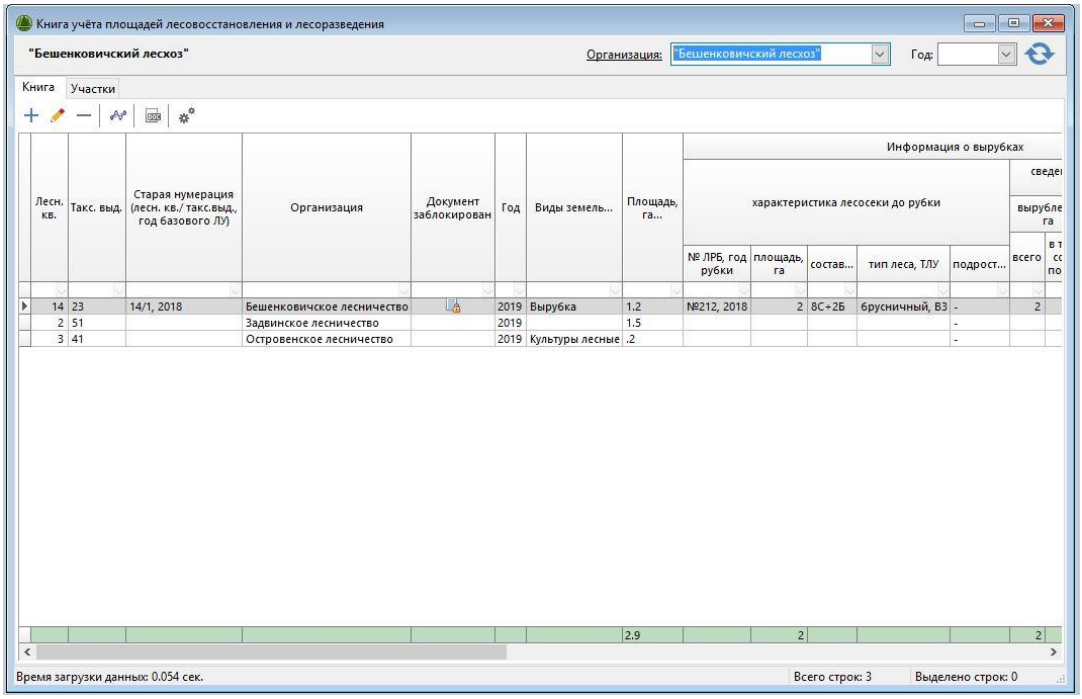
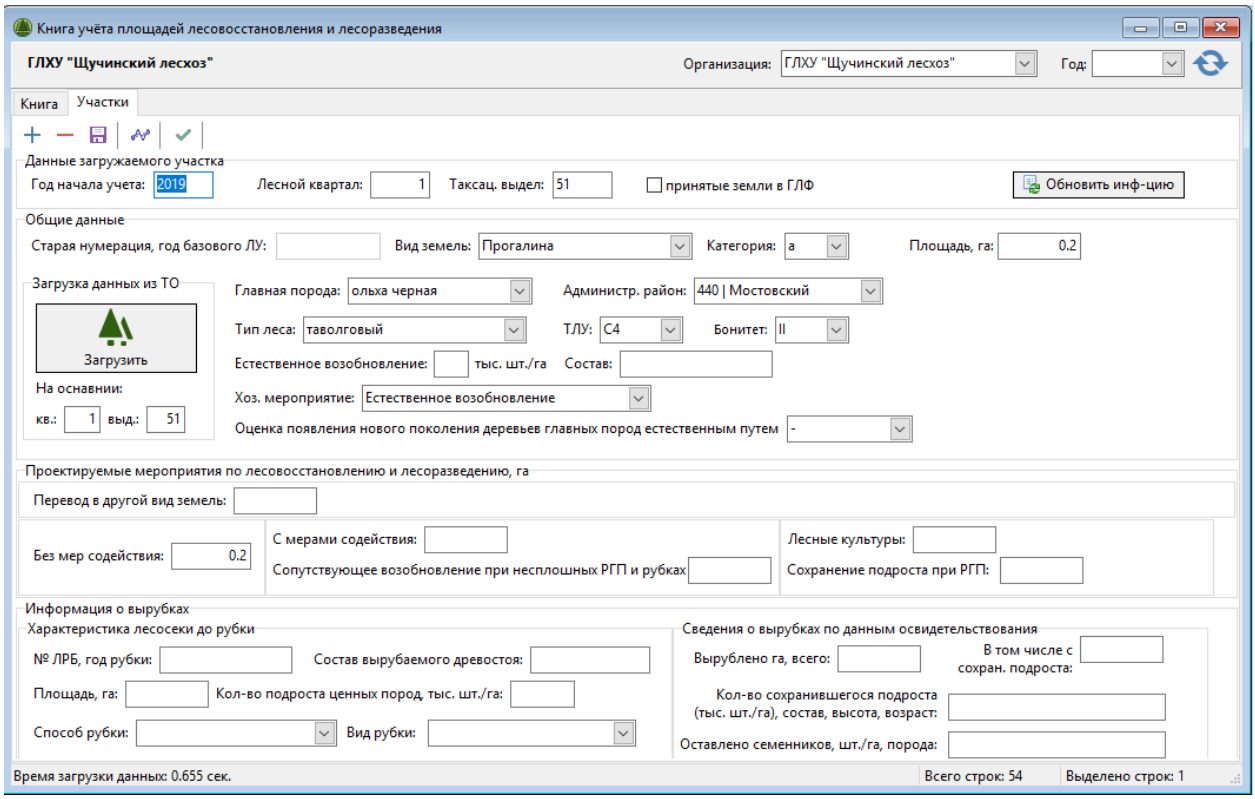


Figure 8.2 Register of reforestation and afforestation areas



8.3 Window used to add a site to the register of areas

8.3 Forest plantings plan

The Forest plantings plan (Figures 8.4, 8.5, 8.6) has three tabs: “List of sites”, “Site” and “Site scheme”; also, it has a panel used to select forestry and the year of forest plantings plan development. The printed form of the document is presented in the appendix 4.

Tab “List of sites” shows a list of forest planting plans depending on the forestry and year.

Tab “Site” is used to edit (function blocked after final editing) and create forest plantings plan.

Tab “Site scheme” is used to store the exposition of the site. Specific attributes of the document are filled.

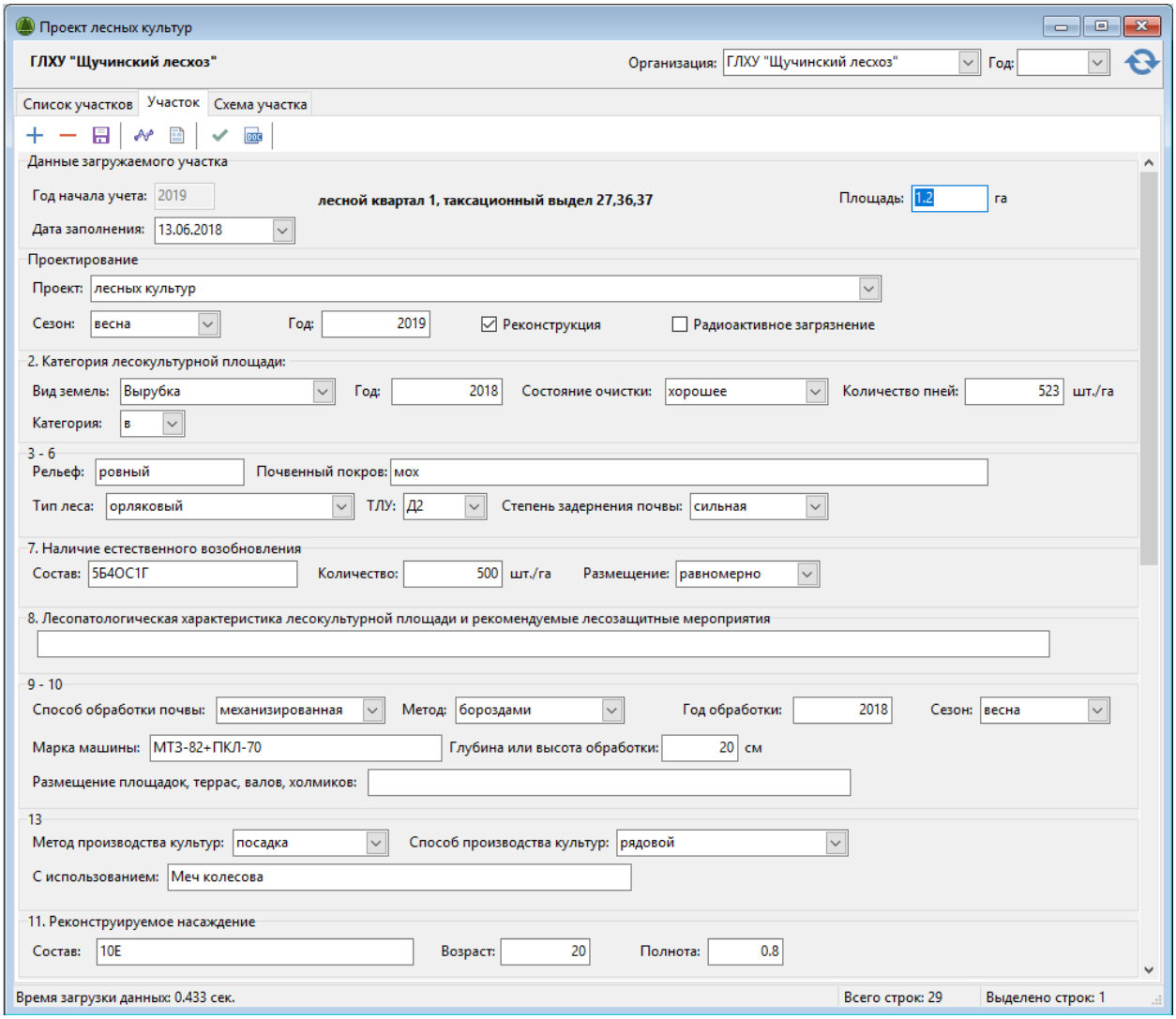


Figure 8.4 Window "Forest plantings plan" (A)

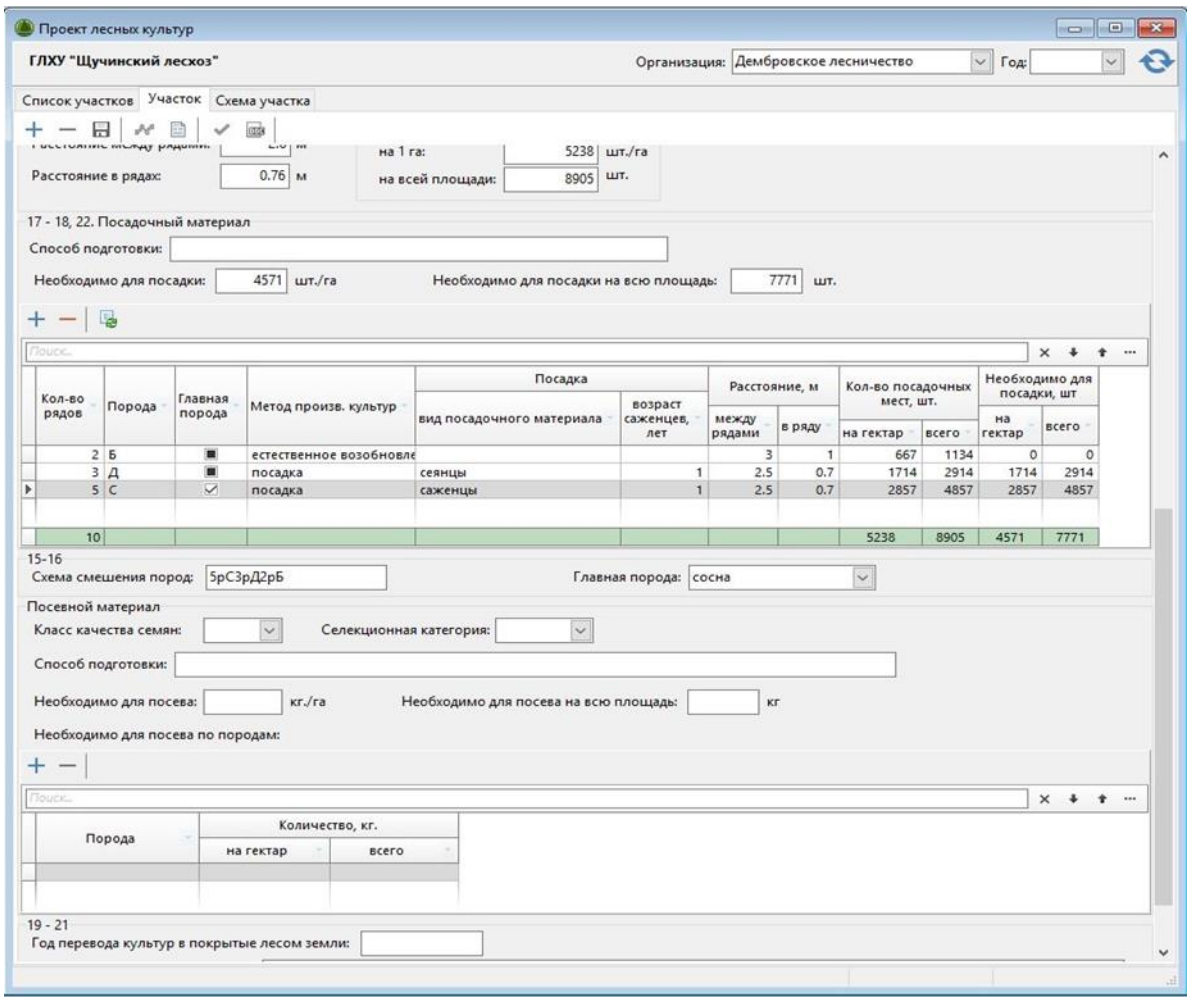


Figure 8.5 Window "Forest plantings plan" (B)

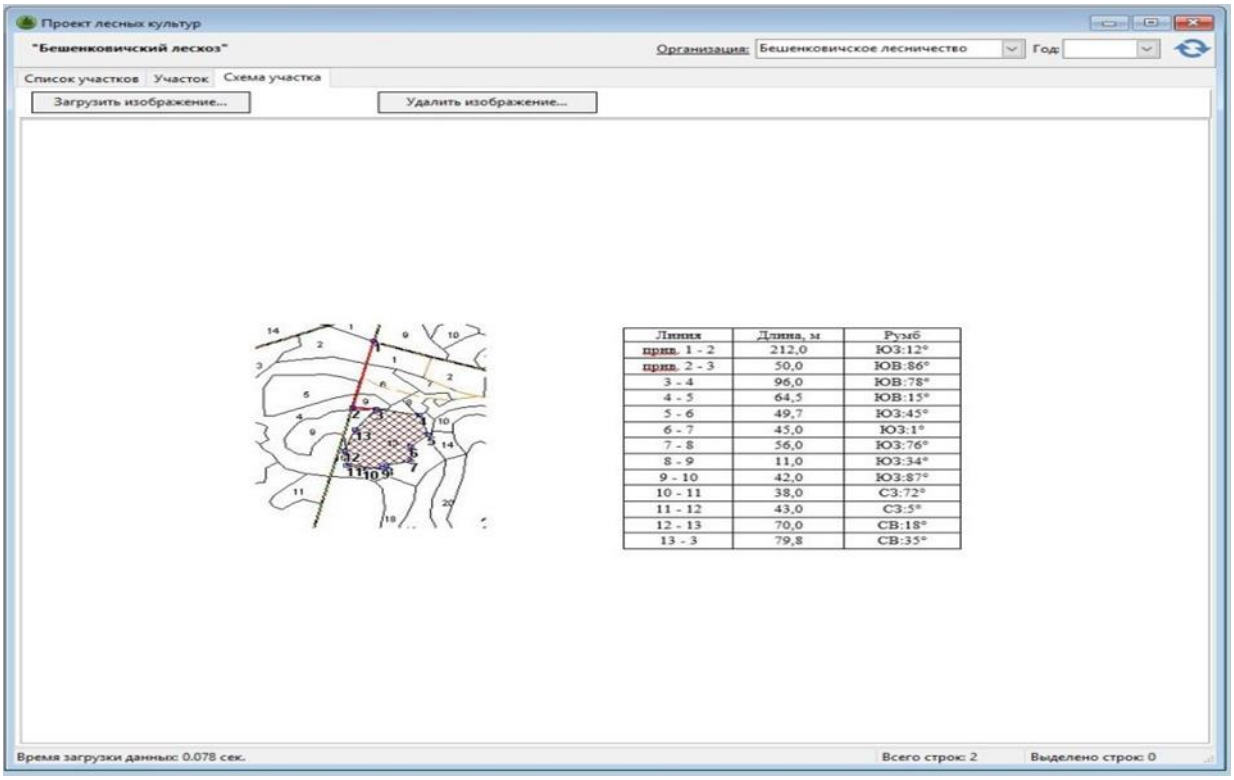


Figure 8.6 Window "Forest plantings plan" (C)

8.4 Passport of artificial forest stands

The Passport of artificial forest stands has two tabs: “List of sites” and “Site” (Figures 8.7, 8.8). The printed form of the document is presented in the appendix 5.

Site scheme is loaded from the Forest plantings plan.

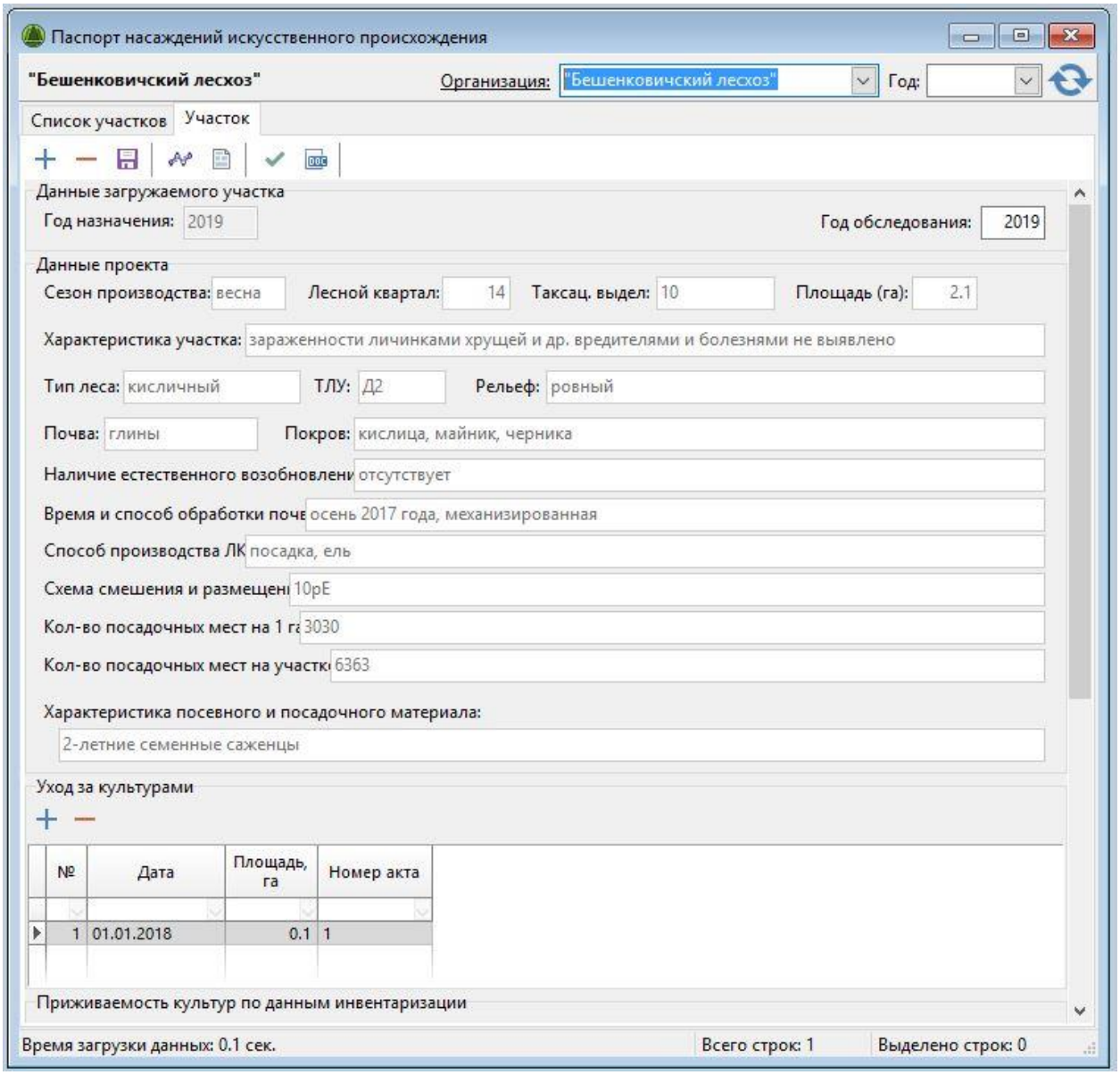


Figure 8.7 Passport of the stands (A)

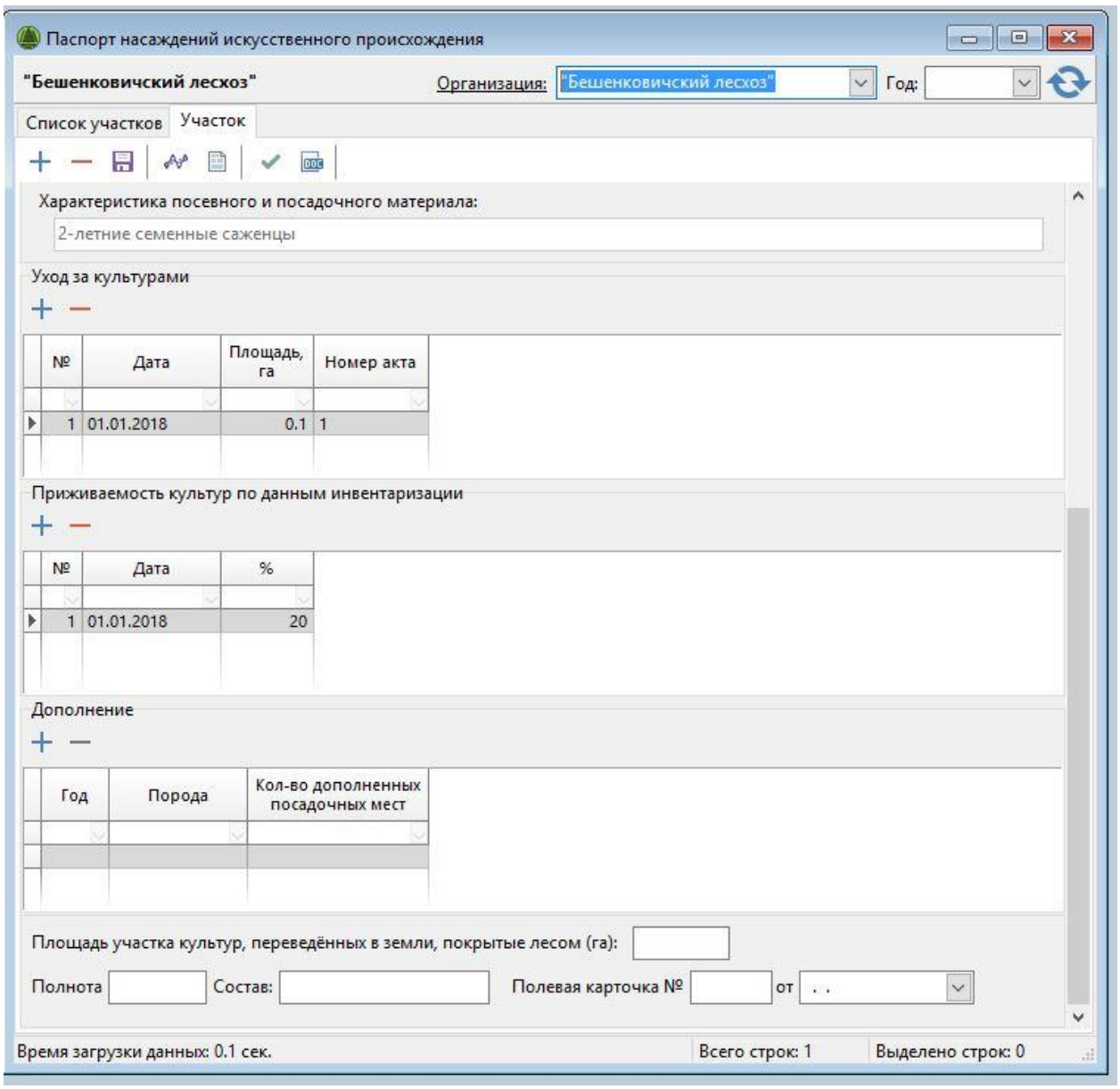


Figure 8.8 Passport of the stands (B)

8.5 Statement to write off forest plantings

Statements to write off forest plantings has two types:

- Statement to write off dead forest plantings;
- Statement to write off plantings, which died from natural disasters.
- Windows of both Statements has two tabs: “List of sites” and “Site”.
- In both Statements tabs “List of sites” have the same interface and only have difference in the content of the columns (Figure 8.9)
- Tab “Site” of the Statement to write off dead forest plantings is represented on Figure 8.10.
- Tab “Site” of the Statement to write plantings, which died from natural disasters is represented on Figure 8.11.
- The printed form of the certificate to write off dead forest crops is presented in Appendix 10.
- The printed form of the certificate to write off forest crops that died from natural disasters is provided in Appendix 9.

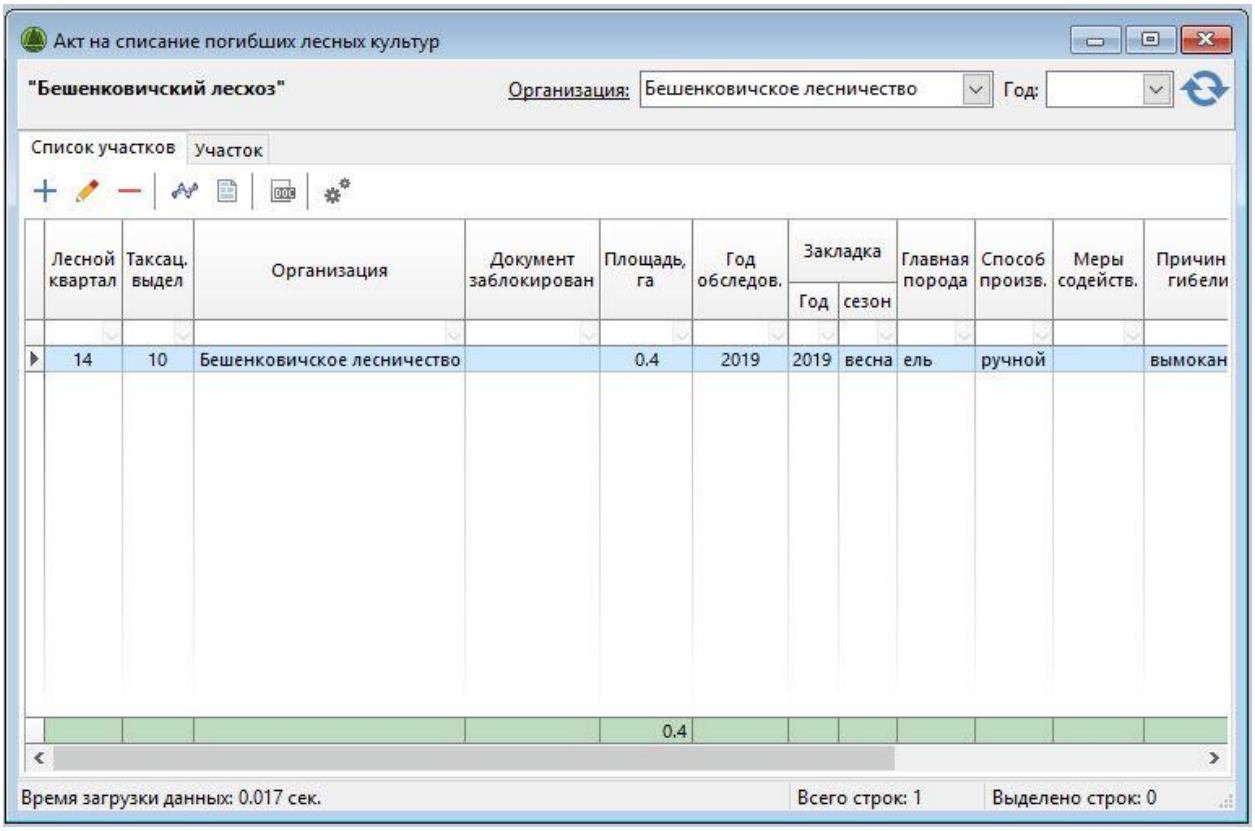


Figure 8.9 List of sites in the Statements to write off dead forest plantings

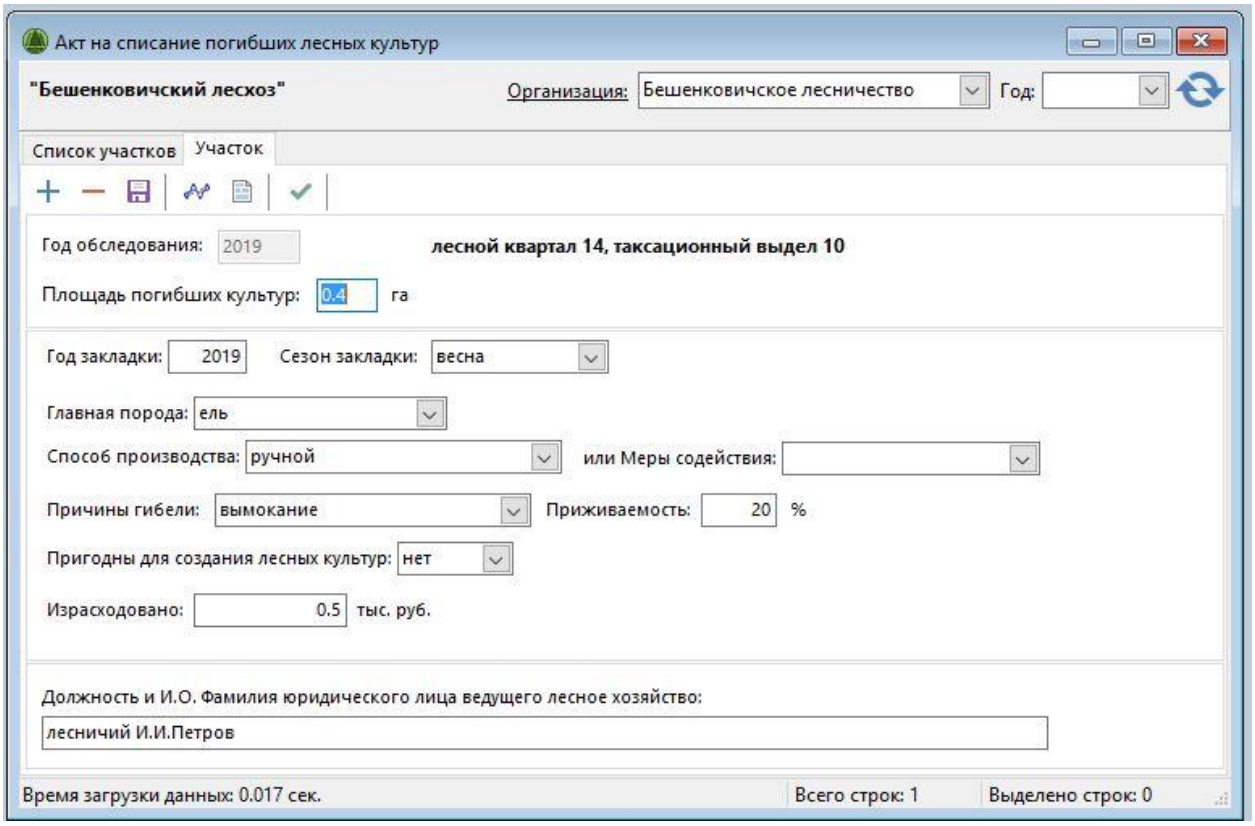


Figure 8.10 Tab "Site" in the window “Statement to write off dead forest plantings”

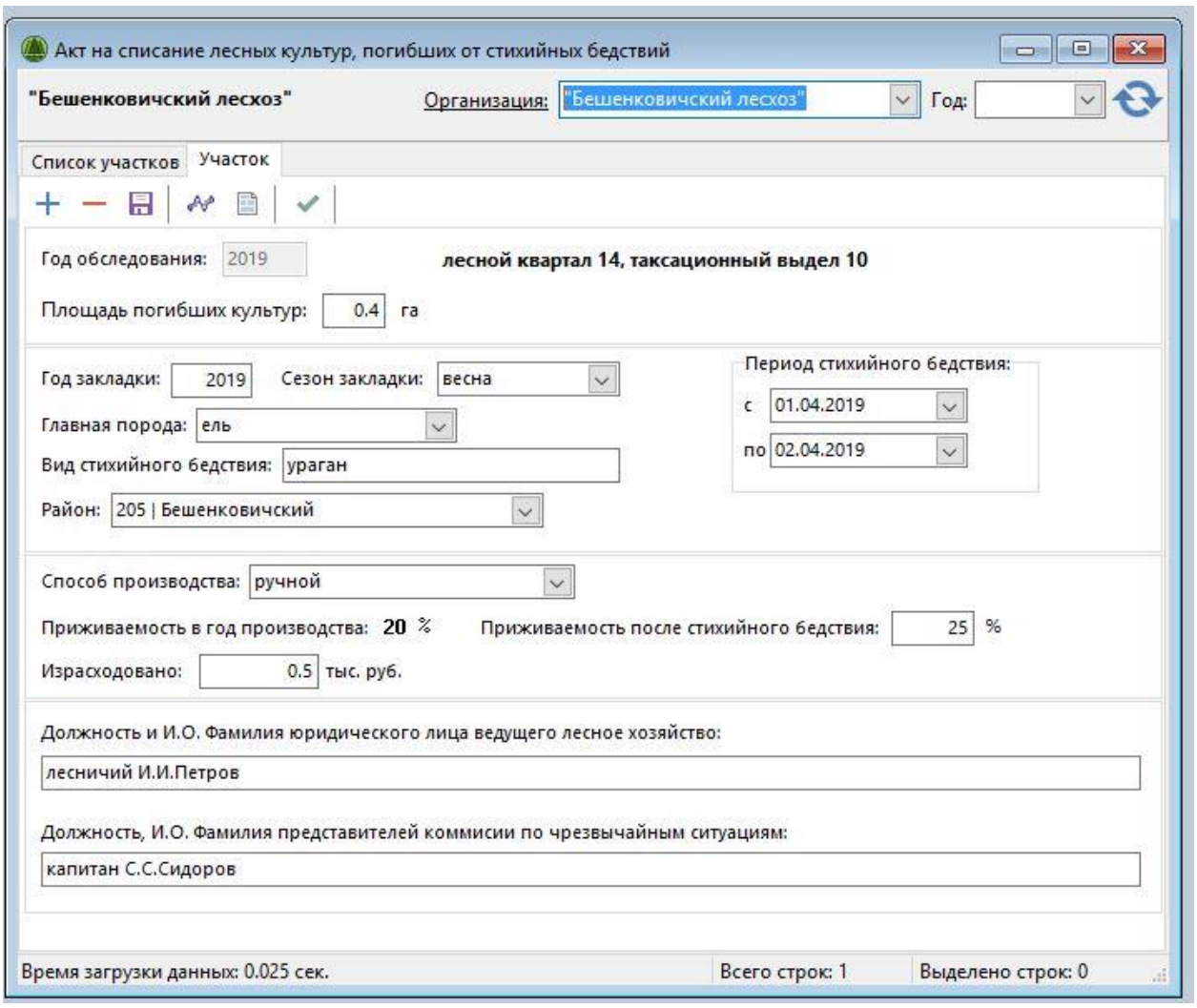


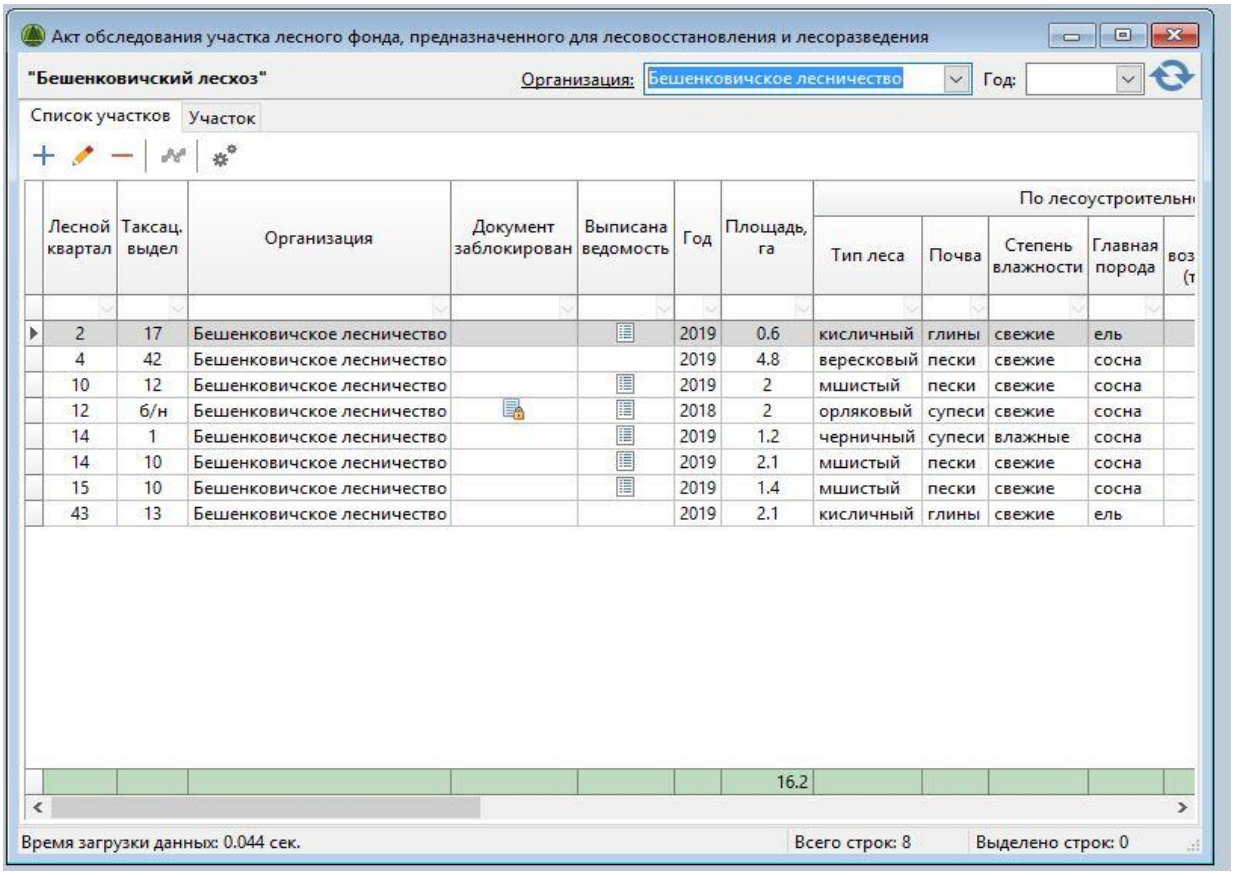
Figure 8.11 Tab "Site" in the window "Statement to write plantings, which died from natural disasters"

8.6 Statement on the inspection of assigned for reforestation and afforestation forest fund sites

The window of “Statement on the inspection of assigned for reforestation and afforestation forest fund sites” is filled when the basic forest management plan has no planned reforestation or afforestation activities.

The window consists of two tabs: “List of sites” (Figure 8.12) and “Site” (Figure 8.13). The document contains sites assigned for reforestation and afforestation. The printed form of the document is presented in the appendix 2.

Data of the forest management database are loaded to the window “Site” after pressing button “Load TO data”.



Акт обследования участка лесного фонда, предназначенного для лесовосстановления и лесоразведения

"Бешенковичский лесхоз" Организация: Бешенковичское лесничество Год:

Список участков | Участок

Лесной квартал	Таксац. выдел	Организация	Документ заблокирован	Выписана ведомость	Год	Площадь, га	По лесоустроительн				
							Тип леса	Почва	Степень влажности	Главная порода	воз (т
2	17	Бешенковичское лесничество			2019	0.6	кисличный	глины	свежие	ель	
4	42	Бешенковичское лесничество			2019	4.8	вересковый	пески	свежие	сосна	
10	12	Бешенковичское лесничество			2019	2	мшистый	пески	свежие	сосна	
12	б/н	Бешенковичское лесничество			2018	2	орляковый	супеси	свежие	сосна	
14	1	Бешенковичское лесничество			2019	1.2	черничный	супеси	влажные	сосна	
14	10	Бешенковичское лесничество			2019	2.1	мшистый	пески	свежие	сосна	
15	10	Бешенковичское лесничество			2019	1.4	мшистый	пески	свежие	сосна	
43	13	Бешенковичское лесничество			2019	2.1	кисличный	глины	свежие	ель	
						16.2					

Время загрузки данных: 0.044 сек. Всего строк: 8 Выделено строк: 0

Figure 8.12 Statement on the inspection of forest fund (A)

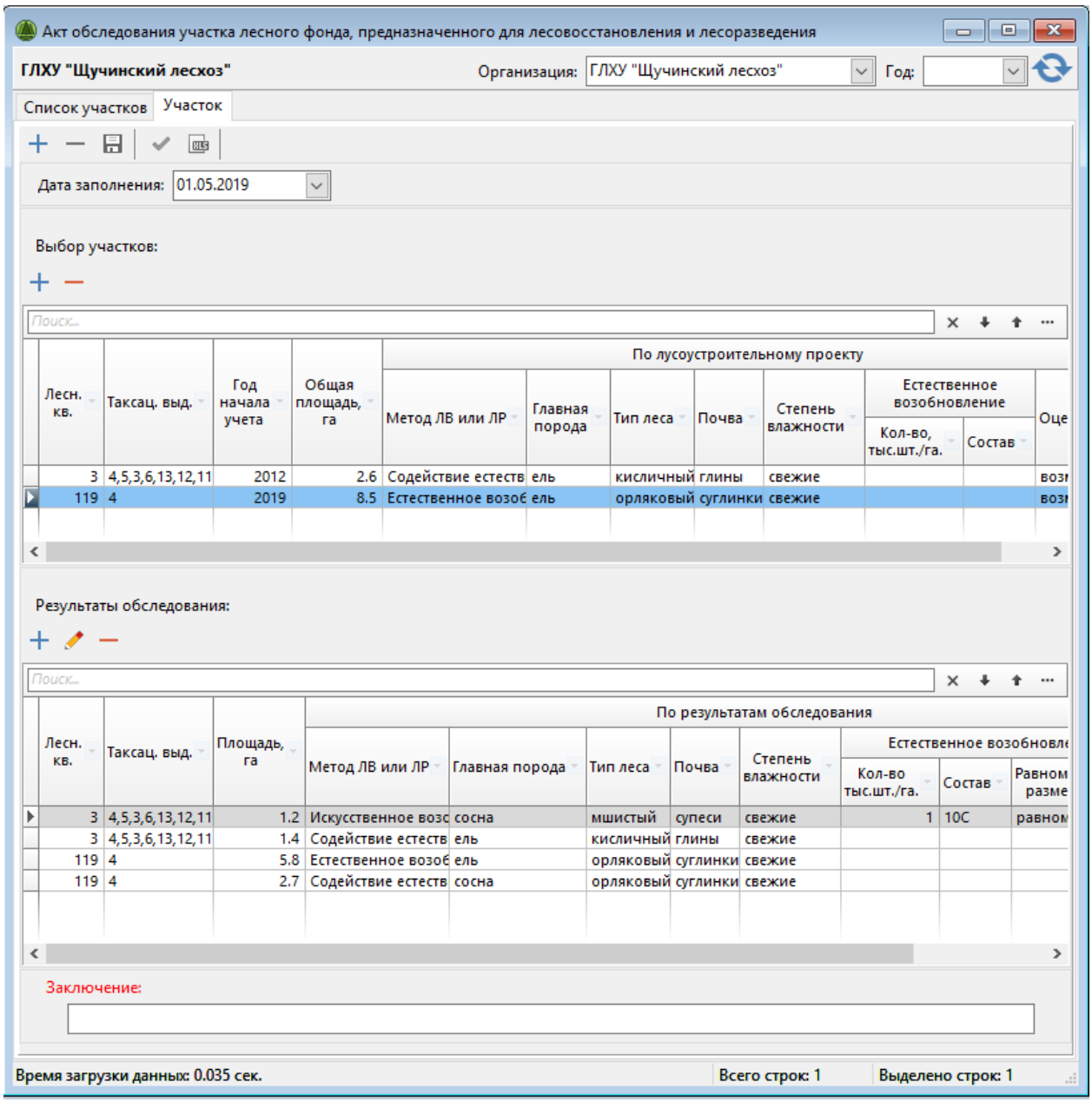


Figure 8.13 Statement on the inspection of forest fund (B)

8.7 Report sheet of technical acceptance of forest plantings

The Report sheet on technical acceptance of forest plantings is filled after planting forest plantings. It consists of two tabs: “List of sites” and “Site”.

The tab “List of sites” has the same interface as the other lists of sites. The tab “Site” is shown on Figure 8.14. The printed form of the document is presented in the appendix 3.

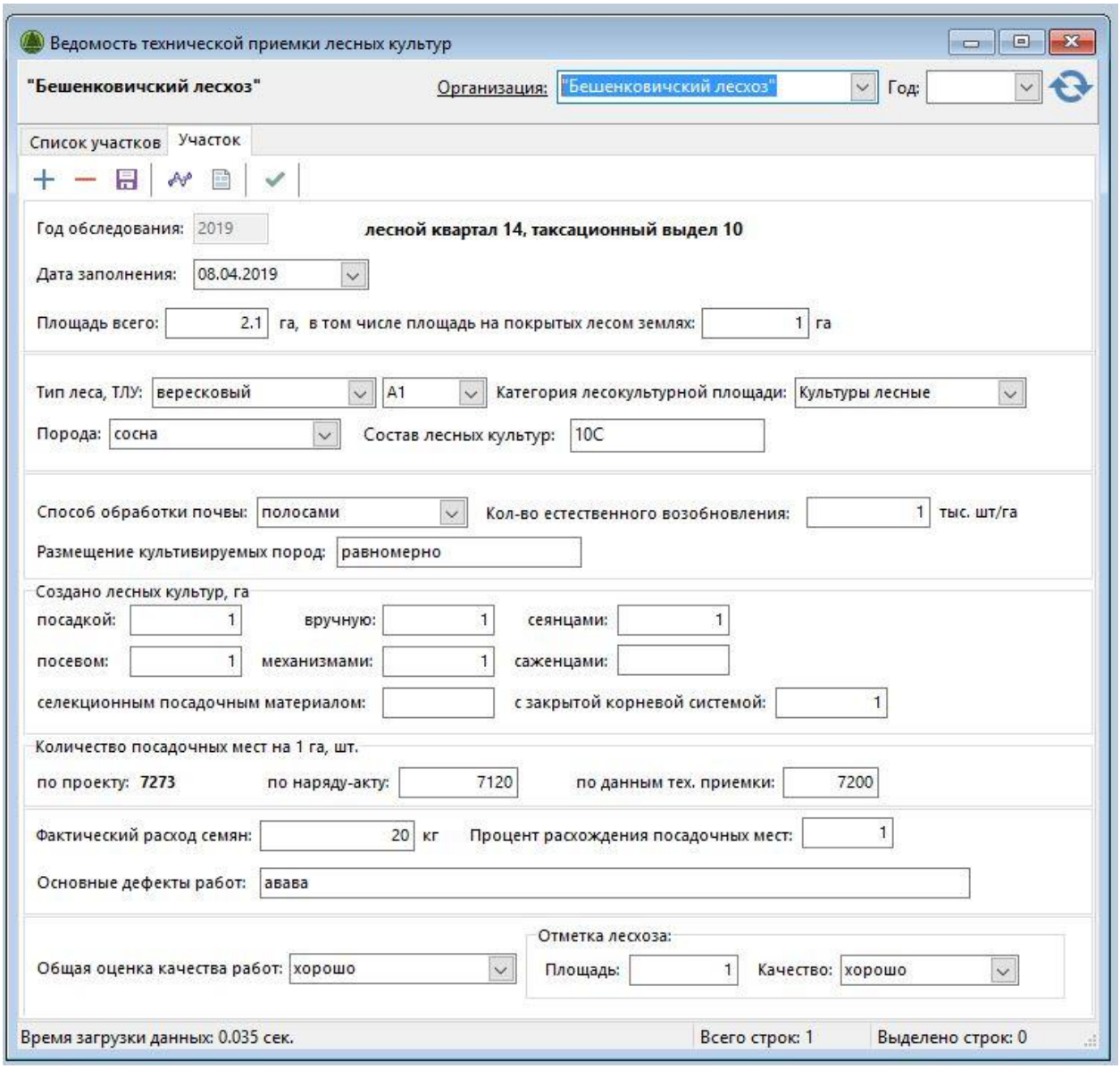


Figure 8.14 Report sheet on technical acceptance of forest plantings

9 MIS “LESOVOSSTANOVLENIYE”. NATURAL REFORESTATION (Stages 3)

9.1 Functions of the system

MIS “Lesovosstanovleniye” (natural reforestation) contains windows of the following documents:

1. Register of areas of reforestation and afforestation;
2. Inspection/ survey report on forest fund designated for reforestation and afforestation;
3. List of sites designed for implementation of actions to assist natural regeneration;
4. List of technical acceptance of works to assist forest natural regeneration;
5. List of sites designated for natural regeneration;
6. Data on natural regeneration of forests;
7. field card of inventory of assisting forest natural regeneration, with preservation of undergrowth of major tree species during clear cutting, accompanying forest regeneration during non-continuous clear-cutting and main cutting;
8. List of inventory sites for natural regeneration without assistance actions.

Every document has specified columns which have their own values. The most possible number of columns is filled automatically.

Menus are well-organized for comfortable navigation among forest fund sites.

9.2 Report sheet of sites assigned for assisted natural reforestation

The Report sheet of sites assigned for assisted natural reforestation has two tabs: “List of sites” (Figure 9.1) and “Site” (Figure 9.2).

The tab “List of sites” has a list of sites filtered by year.

The printed form of the report on plots with assisting actions for natural regeneration of forests is provided in Appendix 11.

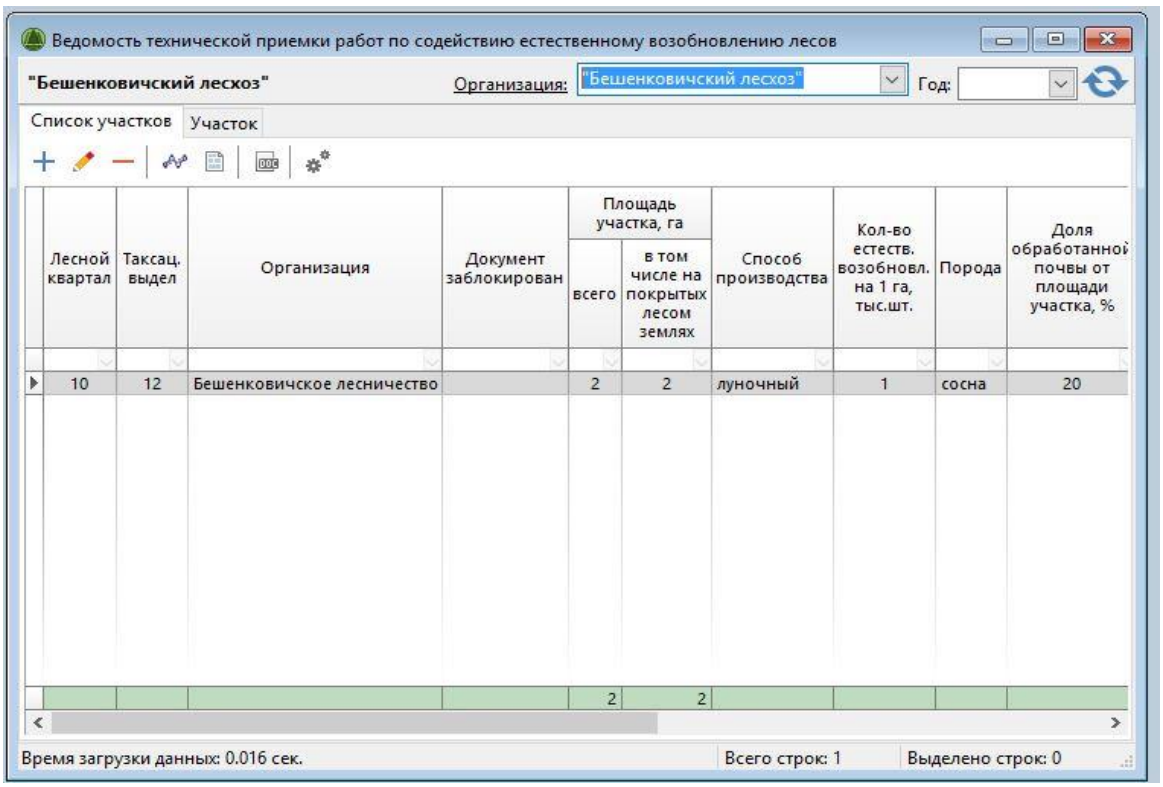


Figure 9.1 Report sheet of sites assigned for assisted natural reforestation. Tab "List of sites"

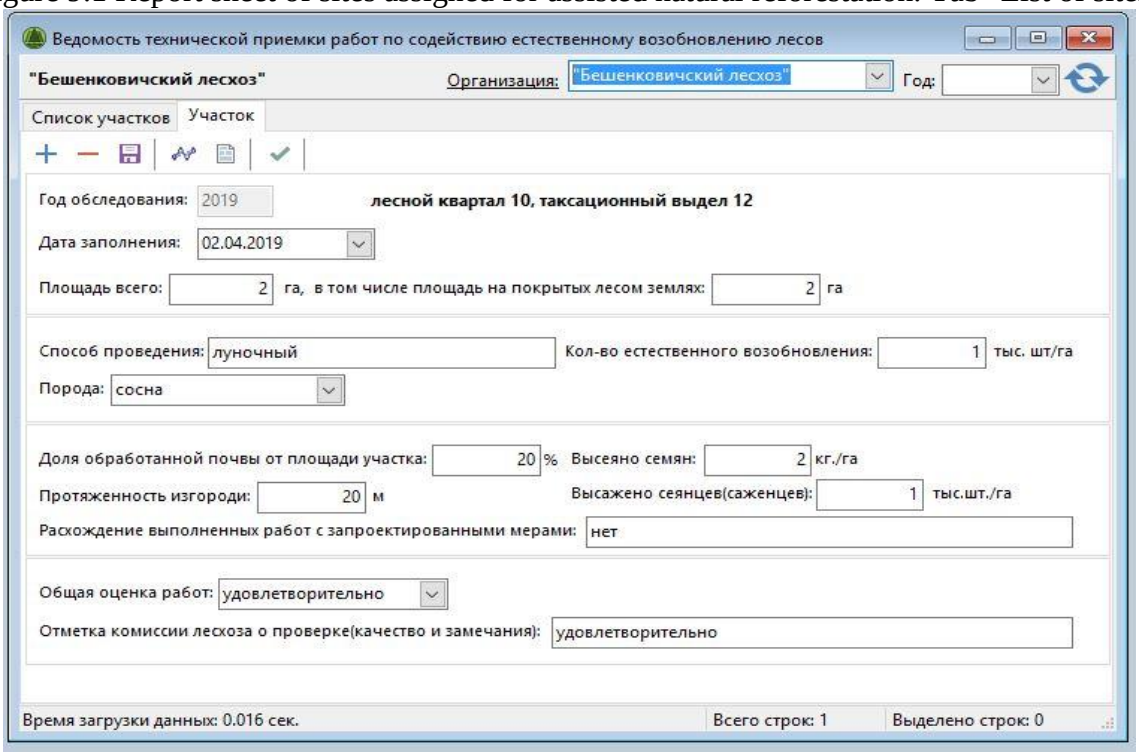


Figure 9.2 Report sheet of sites assigned for assisted natural reforestation. Tab "Site"

9.3 Report sheet of sites assigned for natural reforestation

The Report sheet of sites assigned for natural reforestation has two tabs: “List of sites” and “Site”. The tab “List of sites” has the same interface as the other similar documents. The printed form of the report on plots with assisting actions for natural regeneration of forests is provided in Appendix 12.

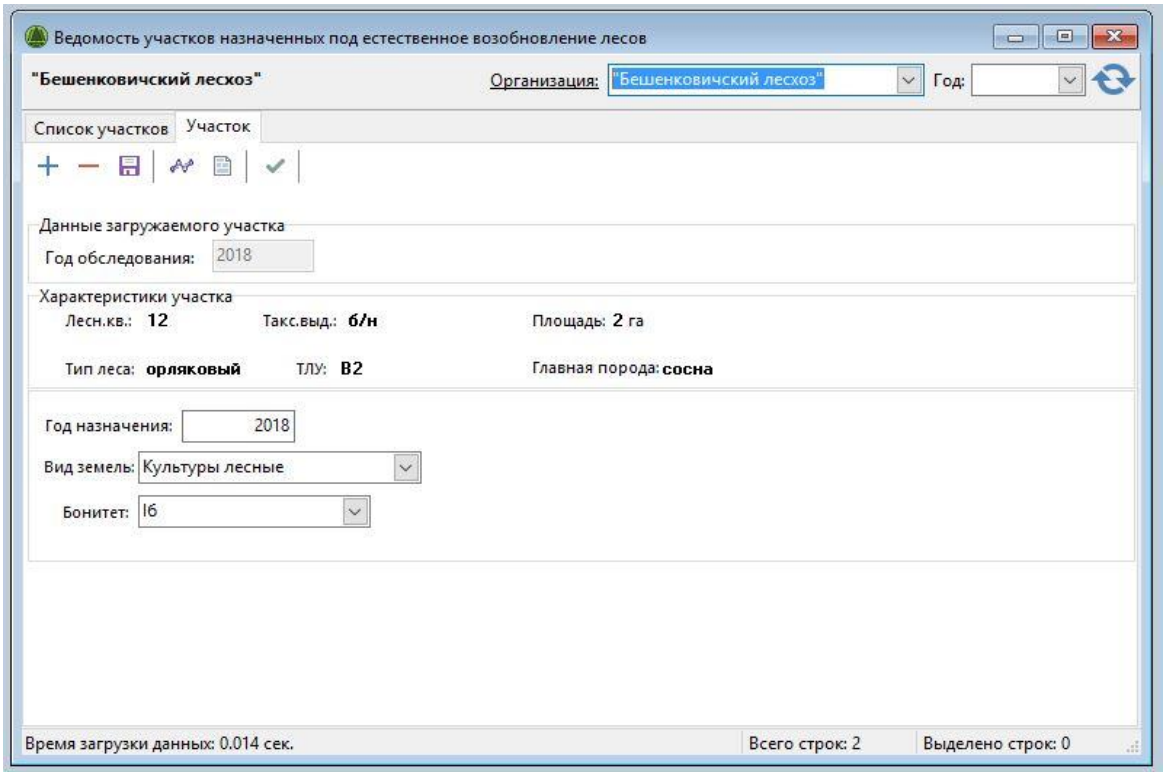


Figure 9.3 The Report sheet of sites assigned for natural reforestation

9.4 Report sheet on technical acceptance of works on natural reforestation assistance

The Report sheet on technical acceptance of works on natural reforestation assistance has two tabs: “List of sites” and “Site” (Figure 9.4). The tab “List of sites” has the same interface as the other similar documents.

The printed form of the document is presented in the appendix 16.

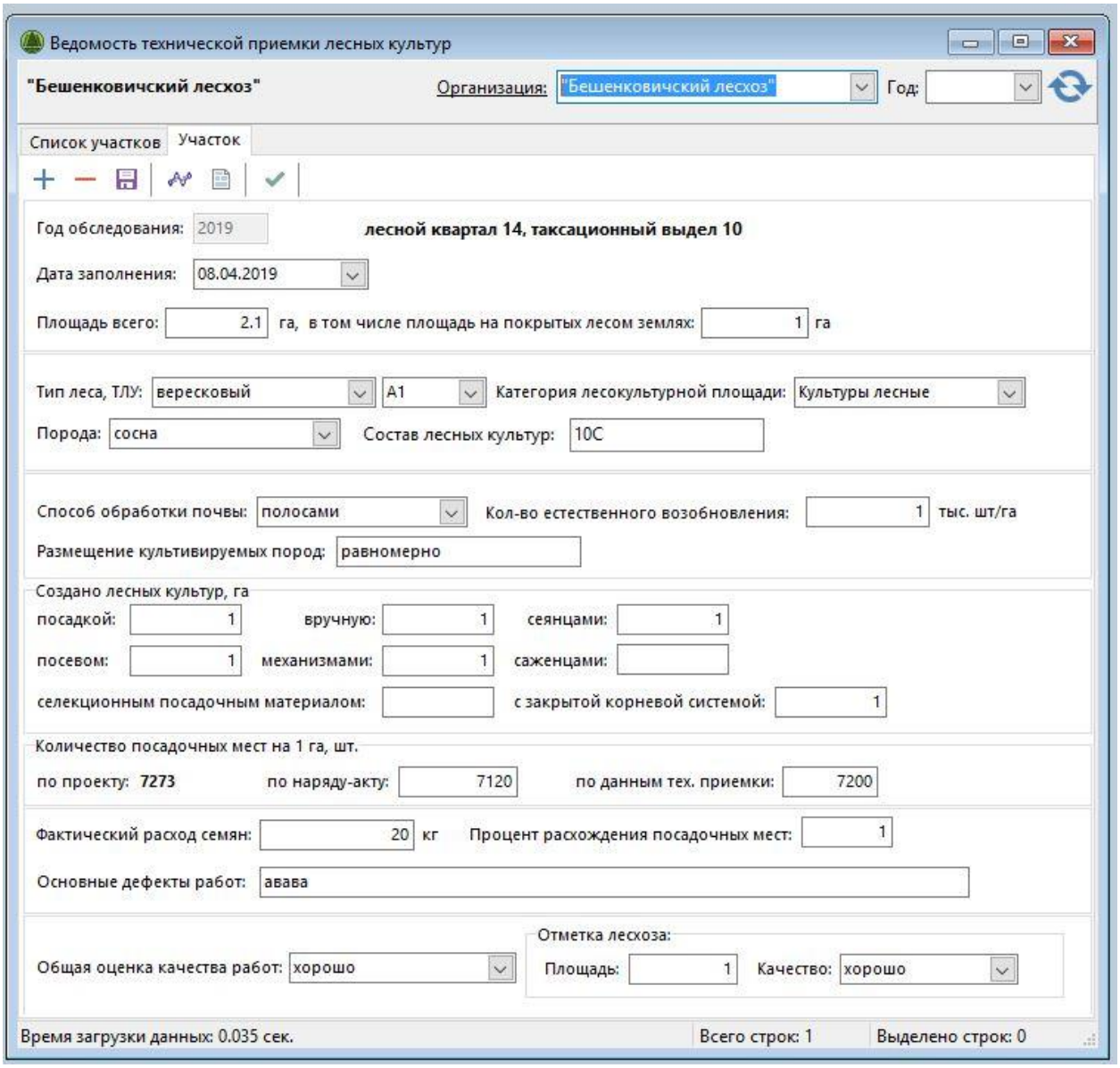


Figure 9.4 Report sheet on technical acceptance of works on natural reforestation assistance. Tab "Site"

9.5 Report sheet on already inspected plots assigned for non-assisted natural reforestation

The Report sheet on already inspected plots assigned for non-assisted natural reforestation has two tabs: “List of sites” and “Site” (Figure 9.5).

The tab “List of sites” has the same interface as the other similar documents.

The printed form of the document is presented in the appendix 15.

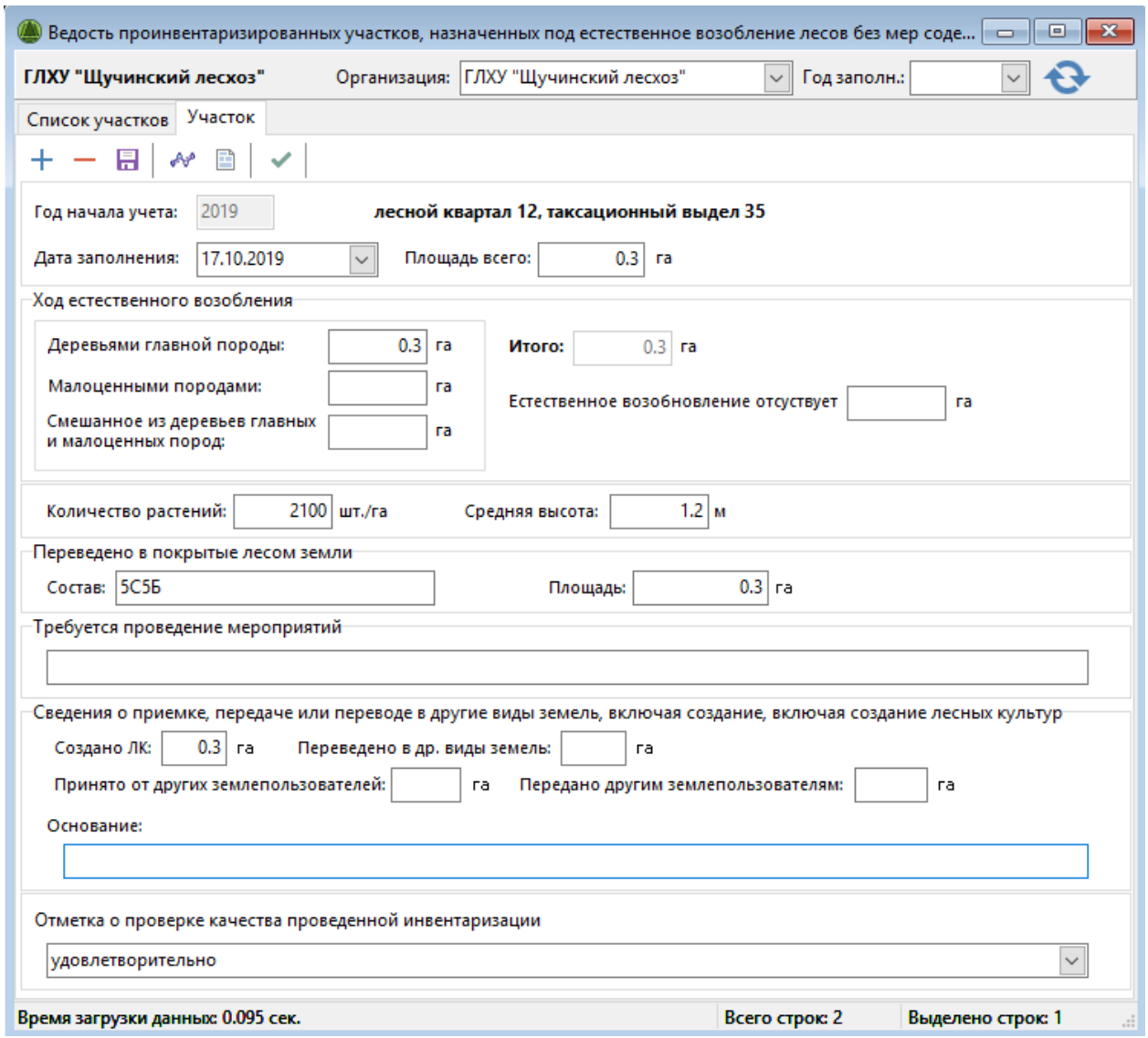


Figure 9.5 Report sheet on already inspected plots assigned for non-assisted natural reforestation. Tab "Site"

10 MIS “LESOVOSSTANOVLENIYE”. PREPARING REPORTS (Stages 4)

10.1 Functions of the system

MIS “Lesovosstanovleniye” prepares the following reports in MS Excel:

1. Consolidated forest crops production project;
2. Consolidated report on inventoried forest and protective forest plantations;
3. Register of forest crops production;
4. Report on the survival rate of forest crops;
5. Report on transfer of forest crops to forested lands;
6. Consolidated report on technical acceptance of forest crops, protective forest plantations;
7. Consolidated list for entry into the category of valuable plantations created by the method of partial regeneration and under the forest canopy;
8. Report on entry of forest stands into the category of valuable forest stands;
9. Reforestation report with actions taken to assist natural forest regeneration;
10. Register of land accounting with actions taken to assist natural regeneration;
11. Consolidated list of the transferred plots with preserved undergrowth during clear-cutting operations, with accompanying reforestation as a result of incomplete clear-cutting and main cutting;
12. Consolidated list of transfer of plots for natural regeneration to the forested lands;
13. Register of passports of artificial plantations;
14. Register of natural regeneration of forests.

All reporting documents are generated by SQL-queries to the database and further by automatic data generation in MSEXCEL and (or) MSWord.

Printed forms of generated documents are provided in appendices 17-30

10.2 Access and location of the reports

Reports can be accessed using the Main menu of the program.

To get aggregated report, one should select menu “Projects” and there select “Aggregated forest plantings report” (Figure 10.1).

After clicking “Aggregated forest plantings report”, a window is opened. In the window such attributes as report year, organization can be selected and a button for export to MS Excel is located (Figure 10.4).

When you click on “Export to excel” button, algorithm of the report preparation begins automatically. The process is showed on the Figure 10.5.

Windows of other reports are used in the same way (Figure 10.4).

In order to access aggregated report, one should select menu item “Aggregated report”.

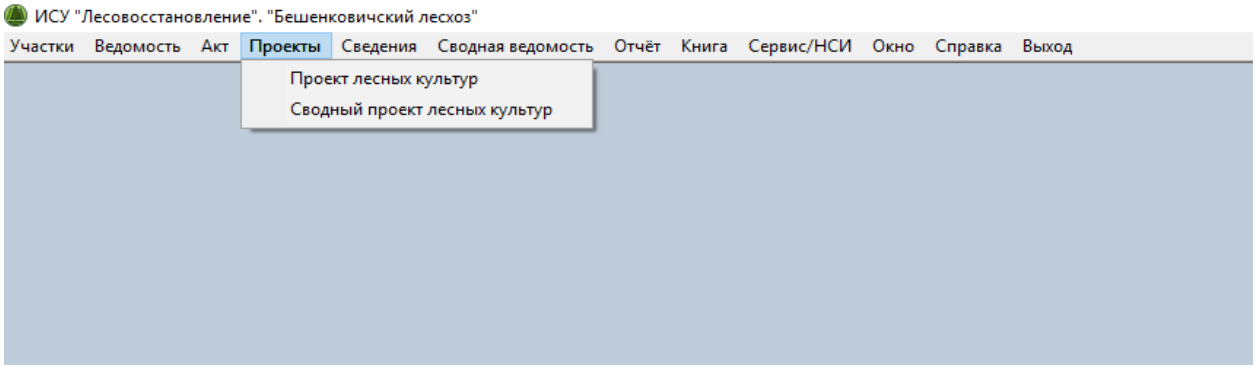


Figure 10.1 Location of the Aggregated forest plantings report

Data on natural reforestation, species compound of transferred to forest-covered lands forest plantings and species compound of created using partial reconstruction and under forest canopy transferred to valuable forest stands category forest plantings is located in menu item “Data” (Figure 10.2).

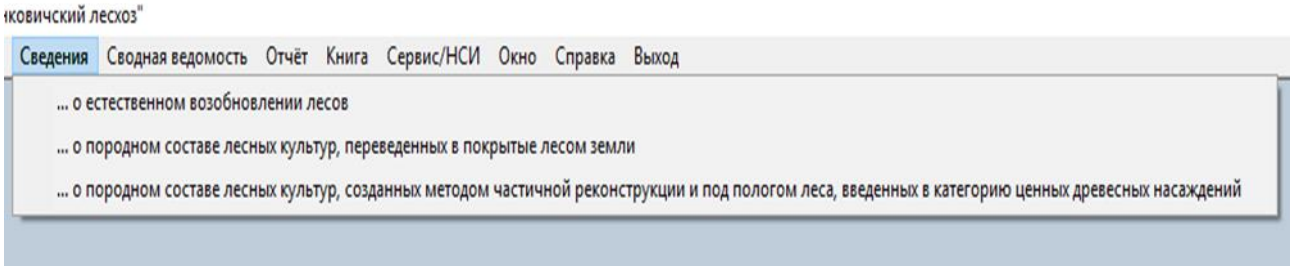


Figure 10.2 Location of the "Data" type reports

Reports on forest plantings transfer to valuable forest stands category, their survival rate and transfer to forest-covered lands category are located in menu item “Report” (Figure 10.3).

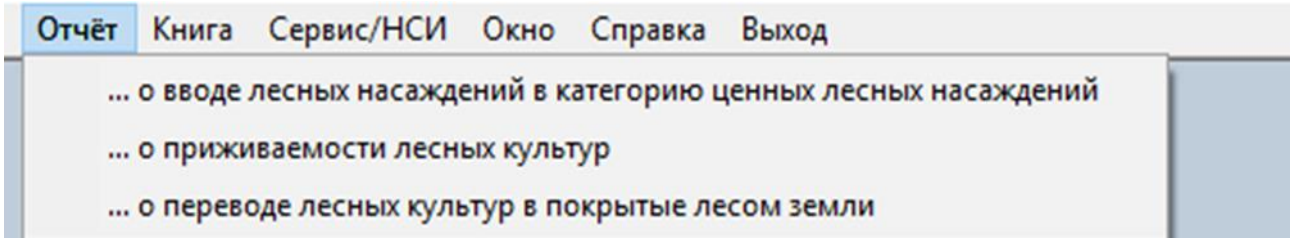


Figure 10.3 Location of the "Report" type reports

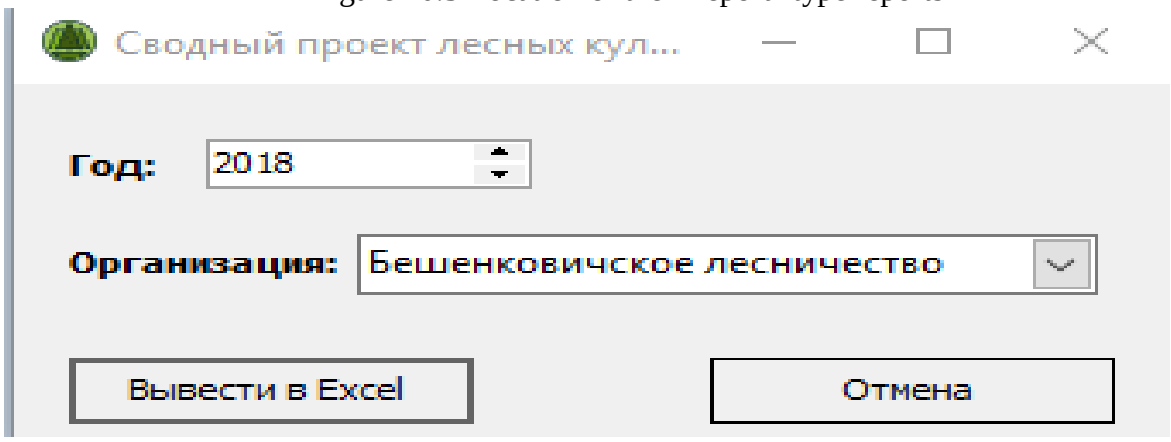
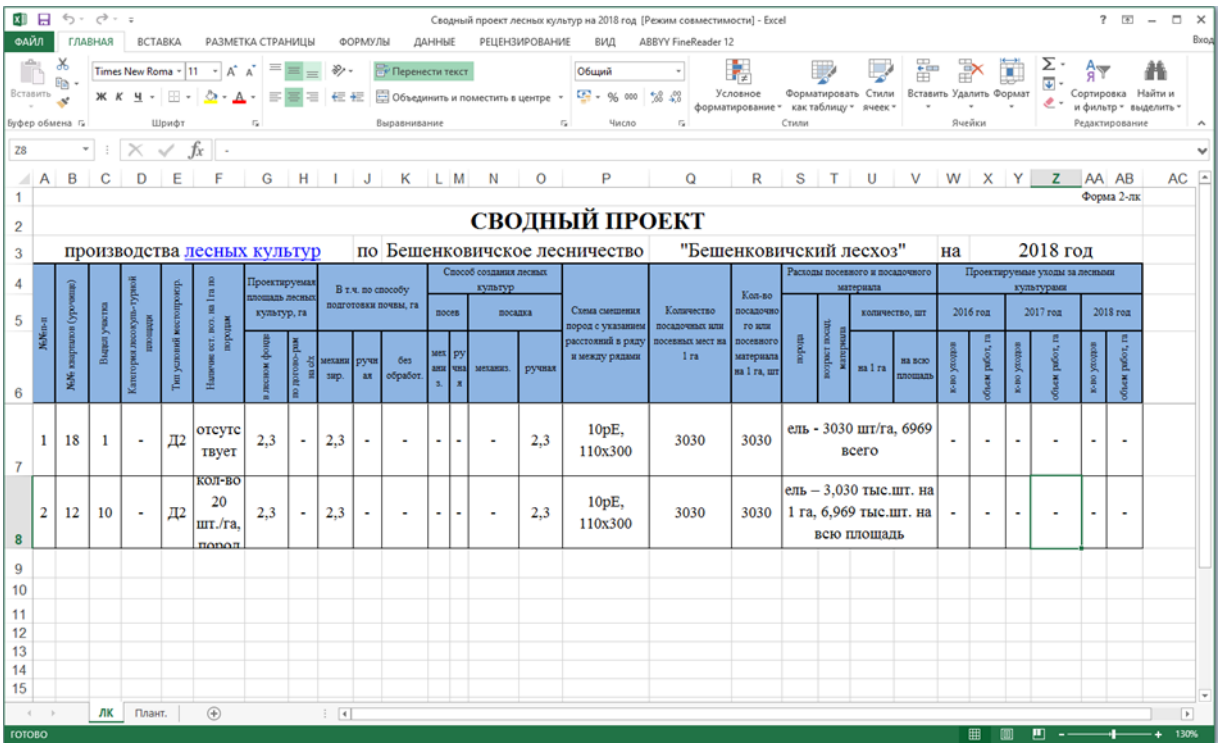


Figure 10.4 Window of preparation of aggregated report in MS Excel



Форма 2-лк

СВОДНЫЙ ПРОЕКТ

производства лесных культур по Бешенковичское лесничество "Бешенковичский лесхоз" на 2018 год

№ п/п	№ кварталов (урочище)	Выдел участка	Категория лесокультурной площади	Тип условий местопроизр.	Наличие ест. возо. на 1 га по породам	Проектируемая площадь лесных культур, га		В т.ч. по способу подготовки почвы, га			Способ создания лесных культур				Схема смешения пород с указанием расстояний в ряду и между рядами	Количество посадочных или посевных мест на 1 га	Кол-во посадочного или посевного материала на 1 га, шт	Расходы посевного и посадочного материала				Проектируемые уходы за лесными культурами					
											посев		посадка							количество, шт		2016 год		2017 год		2018 год	
						в лесном фонде	по договорам на ЛХ	механизир.	ручная	без обработ.	механиз.	ручная	механиз.	ручная				порода	возраст посад. материала	на 1 га	на всю площадь	кол-во уходов	объем работ, га	кол-во уходов	объем работ, га	кол-во уходов	объем работ, га
1	18	1	-	Д2	отсутствует	2,3	-	2,3	-	-	-	-	-	2,3	10рЕ, 110х300	3030	3030	ель - 3030 шт/га, 6969 всего				-	-	-	-	-	-
2	12	10	-	Д2	кол-во 20 шт./га, пород	2,3	-	2,3	-	-	-	-	-	2,3	10рЕ, 110х300	3030	3030	ель – 3,030 тыс.шт. на 1 га, 6,969 тыс.шт. на всю площадь				-	-	-	-	-	-

Figure 10.5 Data processing in MS Excel

11 MIS “LESOVOSSTANOVLENIYE”. INTERACTION WITH THE OTHER INFORMATION SYSTEMS

11.1 Interaction with the forest management database

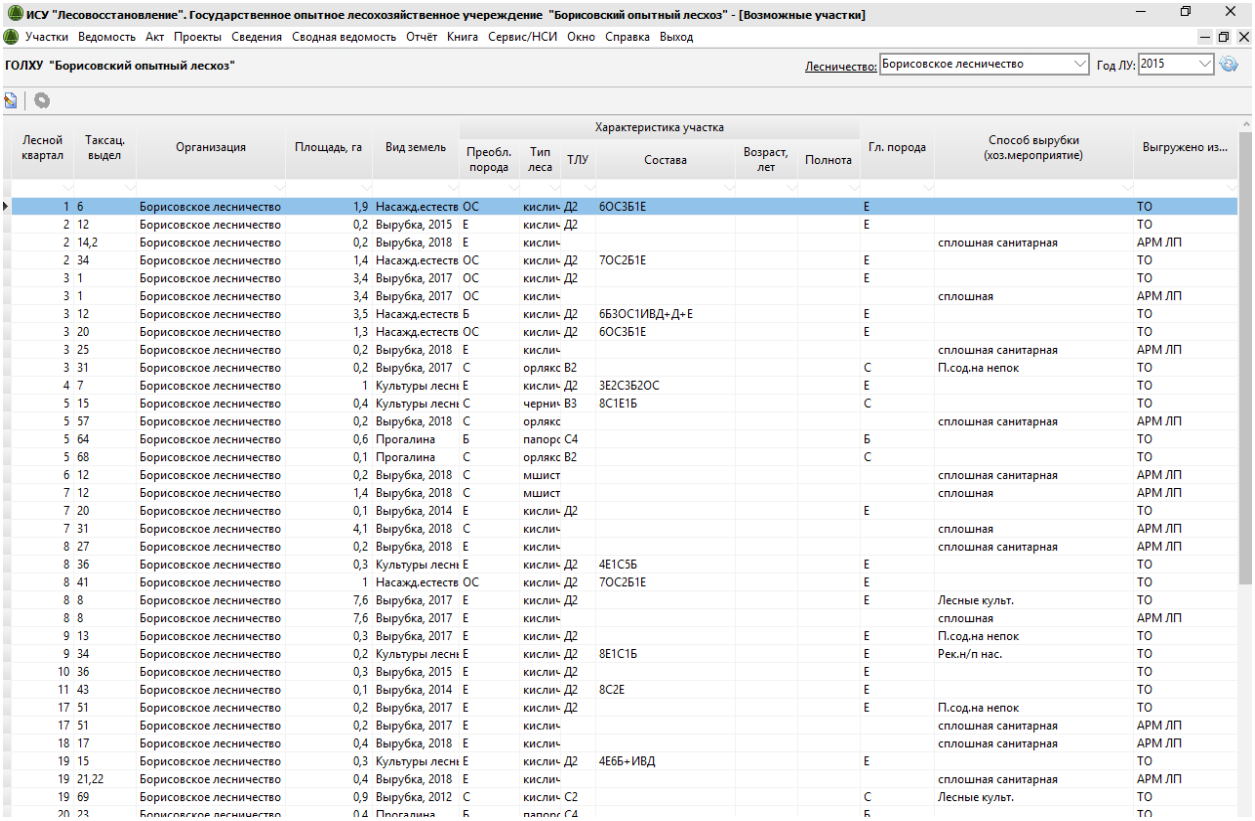
MIS “Lesovosstanovleniye” uses forest management data to find available for reforestation and afforestation sites using window “Available sites”. Using this window, the program connects to forestry database, with SQL-script defines available sites and then imports them to MIS “Lesovosstanovleniye”. Also, forestry data (forest type, type of soil conditions, type of land, etc.) is filled in preliminary documents with the same method.

11.2 Window “Available sites”

Window “Available sites” (Figure 11.1) has been designed. To define available sites, you should select forestry (or forestry enterprise) and year of main forestry enterprise (in order to sort out inaccurate numeration of forest sites that has been exported from AWP “Lesopol’zovaniye”).

Table “Available sites” contains the following characteristics:

1. Forest site;
2. Inventory site;
3. Organization;
4. Area;
5. Type of land;
6. Dominant species;
7. Forest type;
8. Type of soil;
9. Compounds;
10. Age;
11. Density;
12. Main species;
13. Cutting type (activity);
14. Imported from…



Лесной квартал	Таксац. выдел	Организация	Площадь, га	Вид земель	Характеристика участка: Преобл. порода	Тип леса	ТЛУ	Состава	Возраст, лет	Полнота	Гл. порода	Способ вырубки (хоз.мероприятие)	Выгружено из...
1	6	Борисовское лесничество	1,9	Насажд.естеств	ОС	кислич	Д2	6ОС3Б1Е			Е		ТО
2	12	Борисовское лесничество	0,2	Вырубка, 2015	Е	кислич	Д2				Е		ТО
2	14,2	Борисовское лесничество	0,2	Вырубка, 2018	Е	кислич						сплошная санитарная	АРМ ЛП
2	34	Борисовское лесничество	1,4	Насажд.естеств	ОС	кислич	Д2	7ОС2Б1Е			Е		ТО
3	1	Борисовское лесничество	3,4	Вырубка, 2017	ОС	кислич	Д2				Е		ТО
3	1	Борисовское лесничество	3,4	Вырубка, 2017	ОС	кислич						сплошная	АРМ ЛП
3	12	Борисовское лесничество	3,5	Насажд.естеств	Б	кислич	Д2	6Б3ОС1ИВД+Д+Е			Е		ТО
3	20	Борисовское лесничество	1,3	Насажд.естеств	ОС	кислич	Д2	6ОС3Б1Е			Е		ТО
3	25	Борисовское лесничество	0,2	Вырубка, 2018	Е	кислич						сплошная санитарная	АРМ ЛП
3	31	Борисовское лесничество	0,2	Вырубка, 2017	С	орлякс	В2				С	П.сод.на непок	ТО
4	7	Борисовское лесничество	1	Культуры лесн	Е	кислич	Д2	3Е2С3Б2ОС			Е		ТО
5	15	Борисовское лесничество	0,4	Культуры лесн	С	черник	В3	8С1Е1Б			С		ТО
5	57	Борисовское лесничество	0,2	Вырубка, 2018	С	орлякс						сплошная санитарная	АРМ ЛП
5	64	Борисовское лесничество	0,6	Прогалина	Б	папорс	С4				Б		ТО
5	68	Борисовское лесничество	0,1	Прогалина	С	орлякс	В2				С		ТО
6	12	Борисовское лесничество	0,2	Вырубка, 2018	С	мшист						сплошная санитарная	АРМ ЛП
7	12	Борисовское лесничество	1,4	Вырубка, 2018	С	мшист						сплошная	АРМ ЛП
7	20	Борисовское лесничество	0,1	Вырубка, 2014	Е	кислич	Д2				Е		ТО
7	31	Борисовское лесничество	4,1	Вырубка, 2018	С	кислич						сплошная	АРМ ЛП
8	27	Борисовское лесничество	0,2	Вырубка, 2018	Е	кислич						сплошная санитарная	АРМ ЛП
8	36	Борисовское лесничество	0,3	Культуры лесн	Е	кислич	Д2	4Е1С5Б			Е		ТО
8	41	Борисовское лесничество	1	Насажд.естеств	ОС	кислич	Д2	7ОС2Б1Е			Е		ТО
8	8	Борисовское лесничество	7,6	Вырубка, 2017	Е	кислич	Д2				Е	Лесные культ.	ТО
8	8	Борисовское лесничество	7,6	Вырубка, 2017	Е	кислич						сплошная	АРМ ЛП
9	13	Борисовское лесничество	0,3	Вырубка, 2017	Е	кислич	Д2				Е	П.сод.на непок	ТО
9	34	Борисовское лесничество	0,2	Культуры лесн	Е	кислич	Д2	8Е1С1Б			Е	Рек.н/п нас.	ТО
10	36	Борисовское лесничество	0,3	Вырубка, 2015	Е	кислич	Д2				Е		ТО
11	43	Борисовское лесничество	0,1	Вырубка, 2014	Е	кислич	Д2	8С2Е			Е		ТО
17	51	Борисовское лесничество	0,2	Вырубка, 2017	Е	кислич	Д2				Е	П.сод.на непок	ТО
17	51	Борисовское лесничество	0,2	Вырубка, 2017	Е	кислич						сплошная санитарная	АРМ ЛП
18	17	Борисовское лесничество	0,4	Вырубка, 2018	Е	кислич						сплошная санитарная	АРМ ЛП
19	15	Борисовское лесничество	0,3	Культуры лесн	Е	кислич	Д2	4Е6Б+ИВД			Е		ТО
19	21,22	Борисовское лесничество	0,4	Вырубка, 2018	Е	кислич						сплошная санитарная	АРМ ЛП
19	69	Борисовское лесничество	0,9	Вырубка, 2012	С	кислич	С2				С	Лесные культ.	ТО
20	23	Борисовское лесничество	0,4	Прогалина	Б	папорс	С4				Б		ТО

Figure 11.1 Window "Available sites"

11.3 Interaction with “Administrator ISULH”

MIS “Lesovosstanovleniye” is interacted with “Administrator ISULH”.

“Administrator ISULH” manages the database and updates MIS “Lesovosstanovleniye”.

“Administrator ISULH” provides the following functions:

- Create and delete the database of MIS “Lesovosstanovleniye”;
- Update the database of MIS “Lesovosstanovleniye”;
- Control accuracy of data in the database of MIS “Lesovosstanovleniye”;
- Archive and unarchive the database of MIS “Lesovosstanovleniye”;
- Export and import the database of MIS “Lesovosstanovleniye”;
- Provide forest management data for MIS “Lesovosstanovleniye”;
- Update user program of MIS “Lesovosstanovleniye”;

Functions for the update of MIS “Lesovosstanovleniye” components are located in menu “Service”, “Check for updates”, “…for MIS “Lesovosstanovleniye” (Figure 11.2).

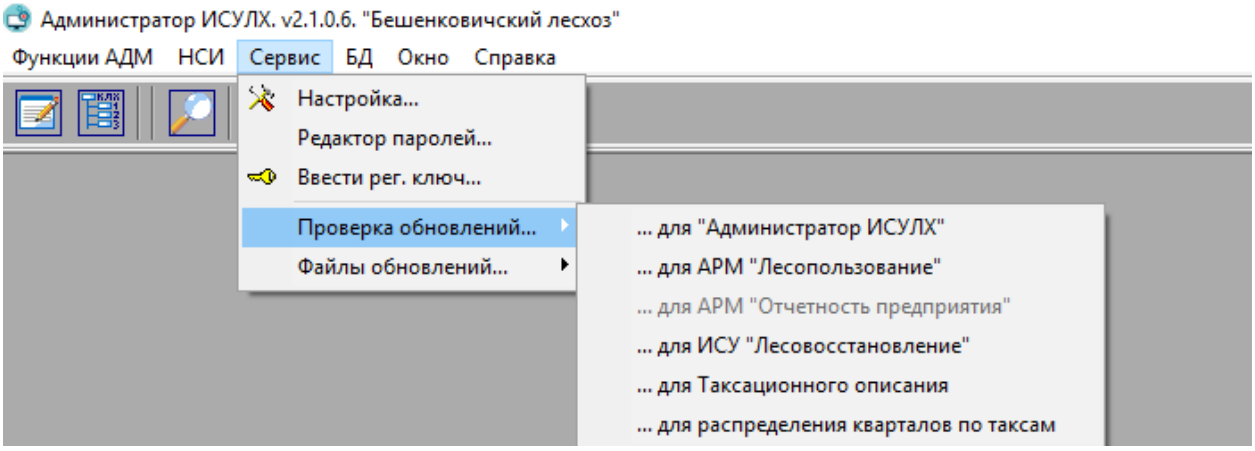


Figure 11.2 Updating MIS "Lesovosstanovleniye"

Functions for the use of the database of MIS “Lesovosstanovleniye” is located in menu “DB” (Figures 11.3 - 11.7).

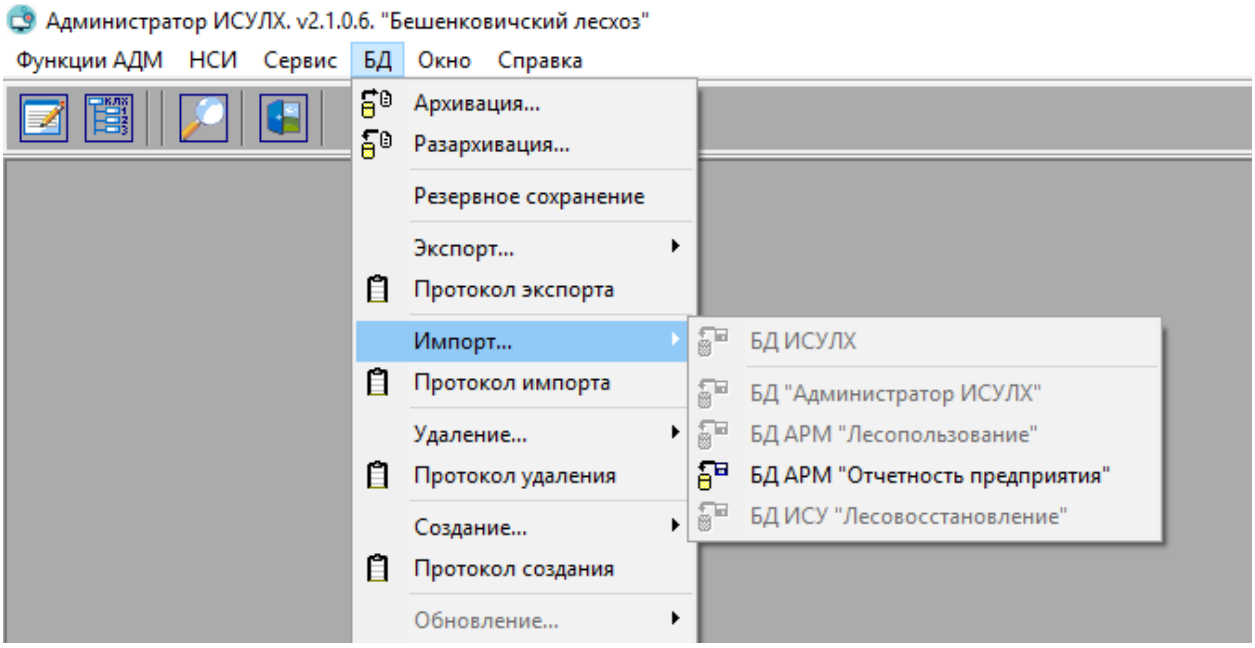


Figure 11.3 Importing the database of MIS "Lesovosstanovleniye"

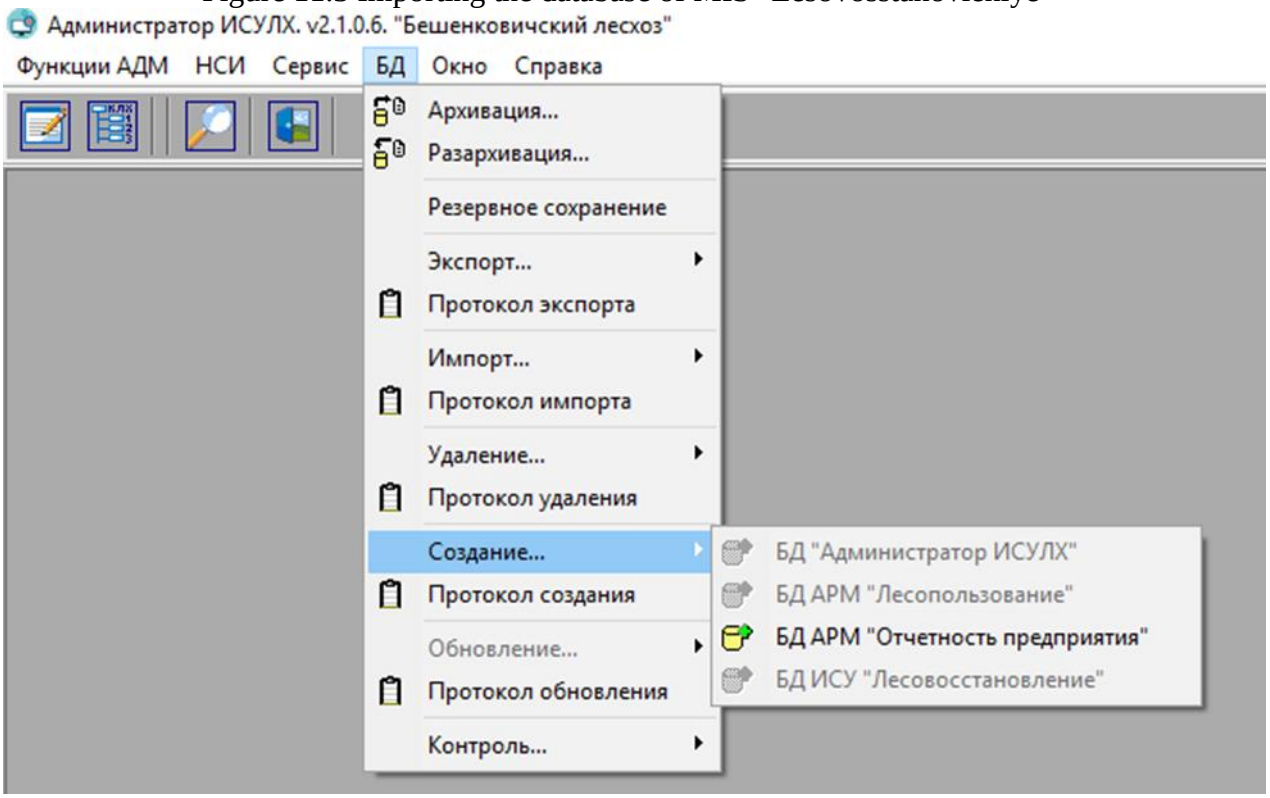


Figure 11.4 Creating the database of MIS "Lesovosstanovleniye"

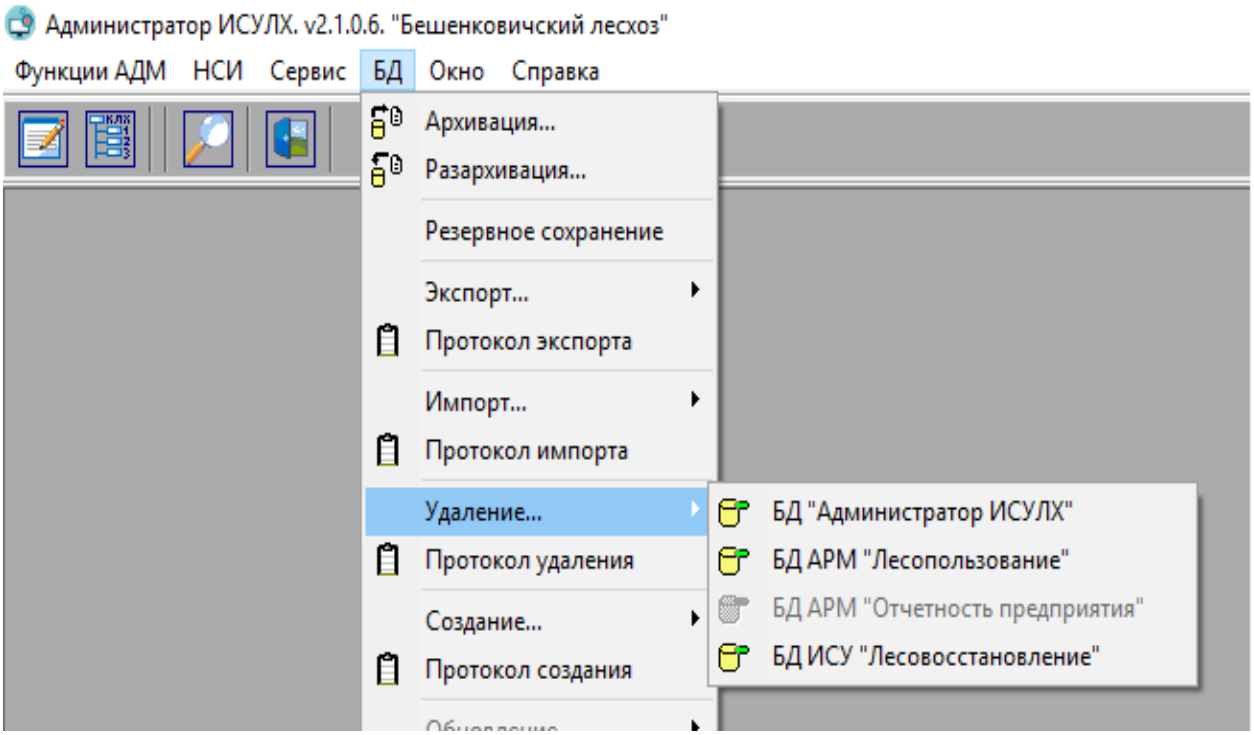


Figure 11.5 Deleting the database of MIS "Lesovosstanovleniye"

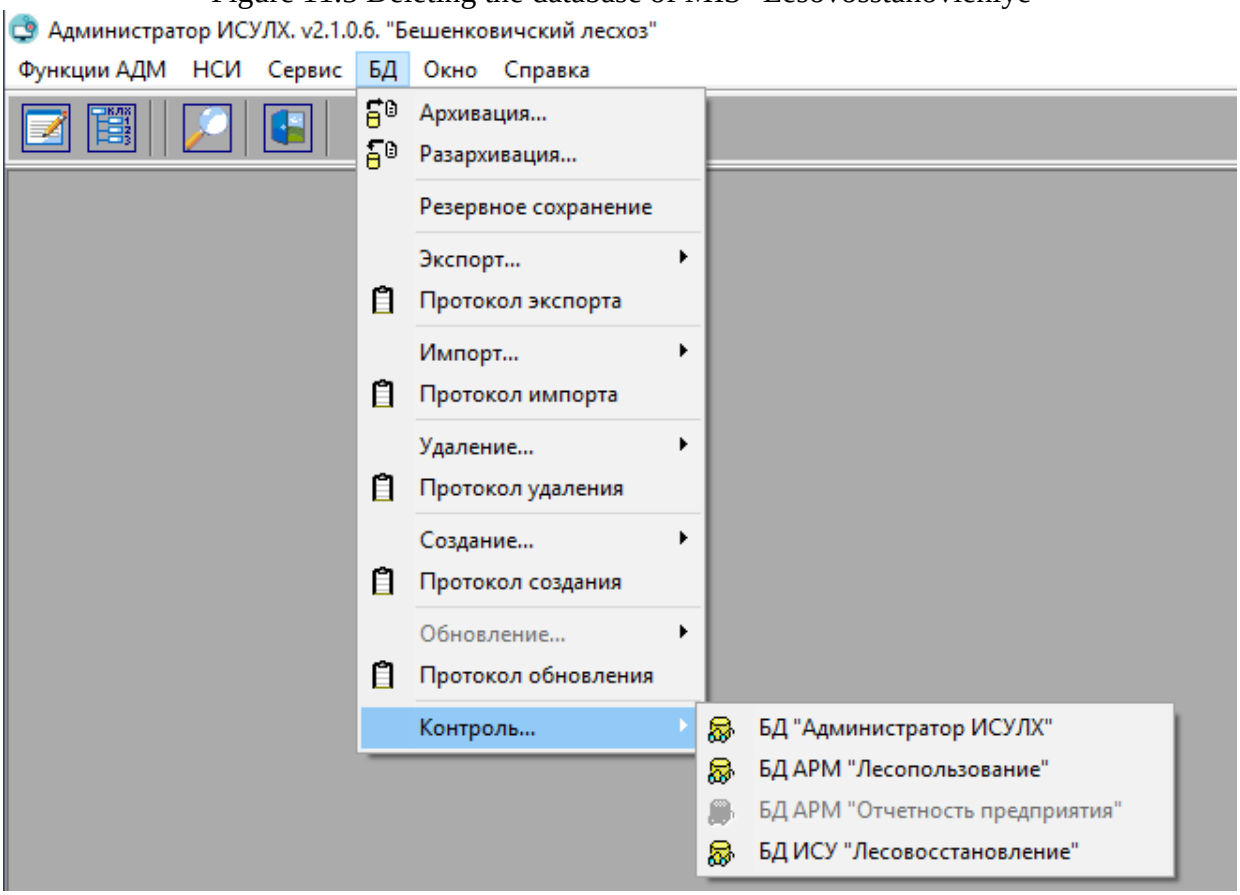


Figure 11.6 Controlling the database of MIS "Lesovosstanovleniye"

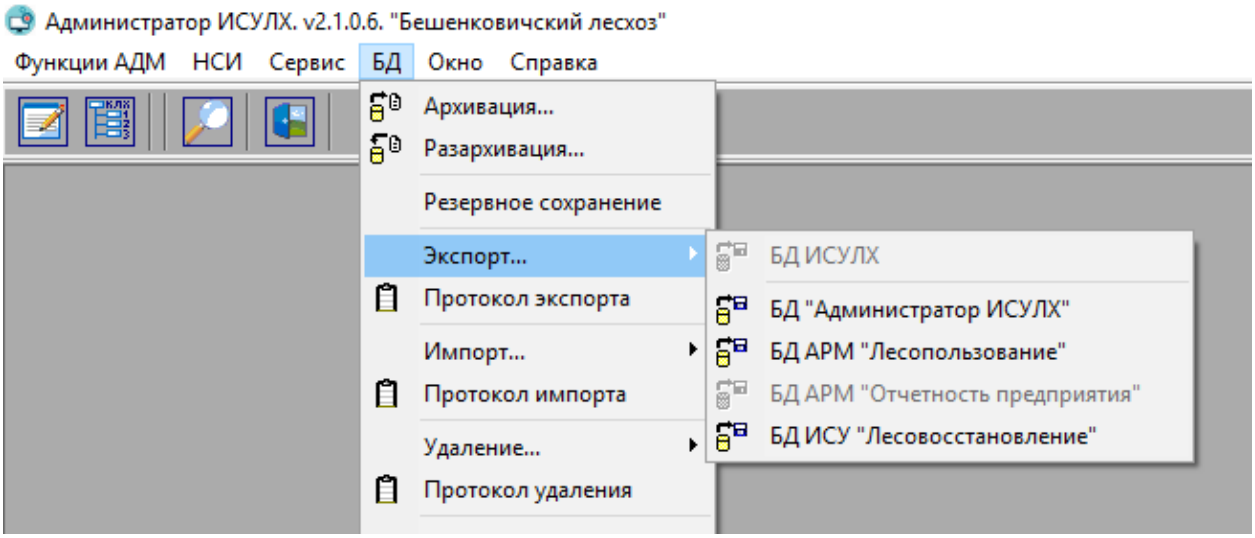


Figure 0.1 Exporting the database of MIS "Lesovosstanovleniye"

11.4 Interaction with AWP “Lesopol’zovaniye”

The system interacts with AWP “Lesopol’zovaniye” to receive the data about forest cutting sites and to use it when preparing a list of available plots, when creating the “Record on afforestation and afforestation areas” (Figure 11.8).

Data on the cutting site before and after cutting is loaded from AWP “Lesopol’zovaniye”. The data consists of:

- Cutting card number;
- Cutting year;
- Area, ha;
- Compound;
- Forest type;
- Type of soil conditions;
- Young growth;
- Cut area, including preserved young growth;
- Number of preserved young growth;
- Seed plants.

Columns are filled if the data on the site is stored in AWP “Lesopol’zovaniye”

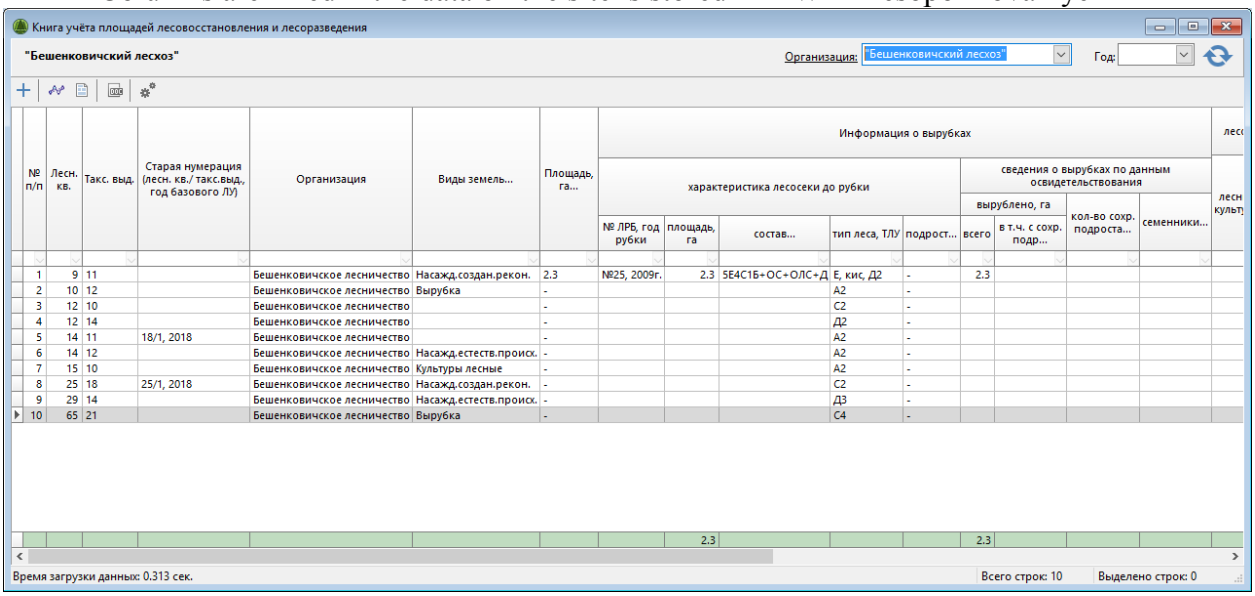


Figure 11.8 Window "Record on afforestation and afforestation areas"

11.5 Interaction with 1C: Forest management

The system interacts with 1C: Forest management to export the data about reforestation and afforestation activities conducted using XML.

11.6 Interaction with the Multilevel geoinformation system of forestry management of the Republic of Belarus “GIS-Les”

The system interacts with “GIS-Les” to import spatial data and make it possible to receive the forest resources data in a form of a map.

The spatial data is used in such windows as “Forest plantings plan” and “Passport of artificial forest stands”. Imported spatial data is connected to a site and is stored in the database in “.jpg” format.

MIS “Lesovosstanovleniye” doesn’t copy functions of already existing applications. Thus, all the site spatial data is stored in the Multilevel geoinformation system of the Republic of Belarus, and MIS “Lesovosstanovleniye” only exports spatial data and explicates a site.

12 MIS “LESOVOSSTANOVLENIYE”. SERVER (Stages 5)

12.1 General provisions

The server interacts with “Administrator ISULH” (Paragraph 11.2).
“Administrator ISULH” manages the database and updates MIS “Lesovosstanovleniye”.
“Administrator ISULH” provides the following functions:

- Create and delete the database of MIS “Lesovosstanovleniye”;
- Update the database of MIS “Lesovosstanovleniye”;
- Control accuracy of data in the database of MIS “Lesovosstanovleniye”;
- Archive and unarchive the database of MIS “Lesovosstanovleniye”;
- Export and import the database of MIS “Lesovosstanovleniye”;
- Provide forest management data for MIS “Lesovosstanovleniye”;
- Update user program of MIS “Lesovosstanovleniye”.

12.2 Institutions using MIS “Lesovosstanovleniye”

Primary reports are prepared in forestries, stored in digital form (Oracle 11g XE database) and copied to the forestry enterprise server through Internet. When there is no network, the data can be loaded to a physical storage using window “Existing plots” (Figure 12.1).

In forestry enterprises, users (reforestation engineers) can prepare reports in digital form (Oracle 11g XE database) using the data received from forestries. If there is Internet connection, reports and aggregated data is copied to the server of RUE “Belgosles”.

In the central server of RUE “Belgosles”, the data received from forestry enterprises is analysed. Then interested parties receive the statistics (Production Forestry Associations, Ministry of Forestry, etc.)

The scheme of data exchange between institutions using MIS “Lesovosstanovleniye” is shown on Figure 12.2.

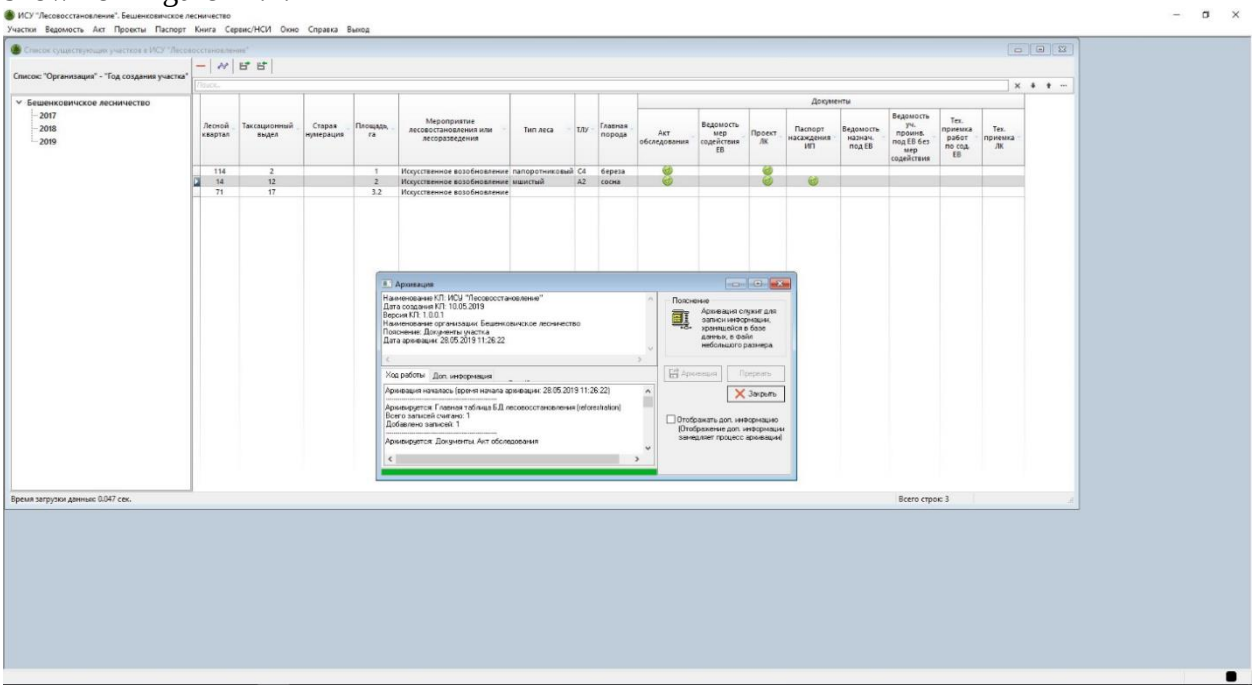


Figure 12.1 Export of primary reports

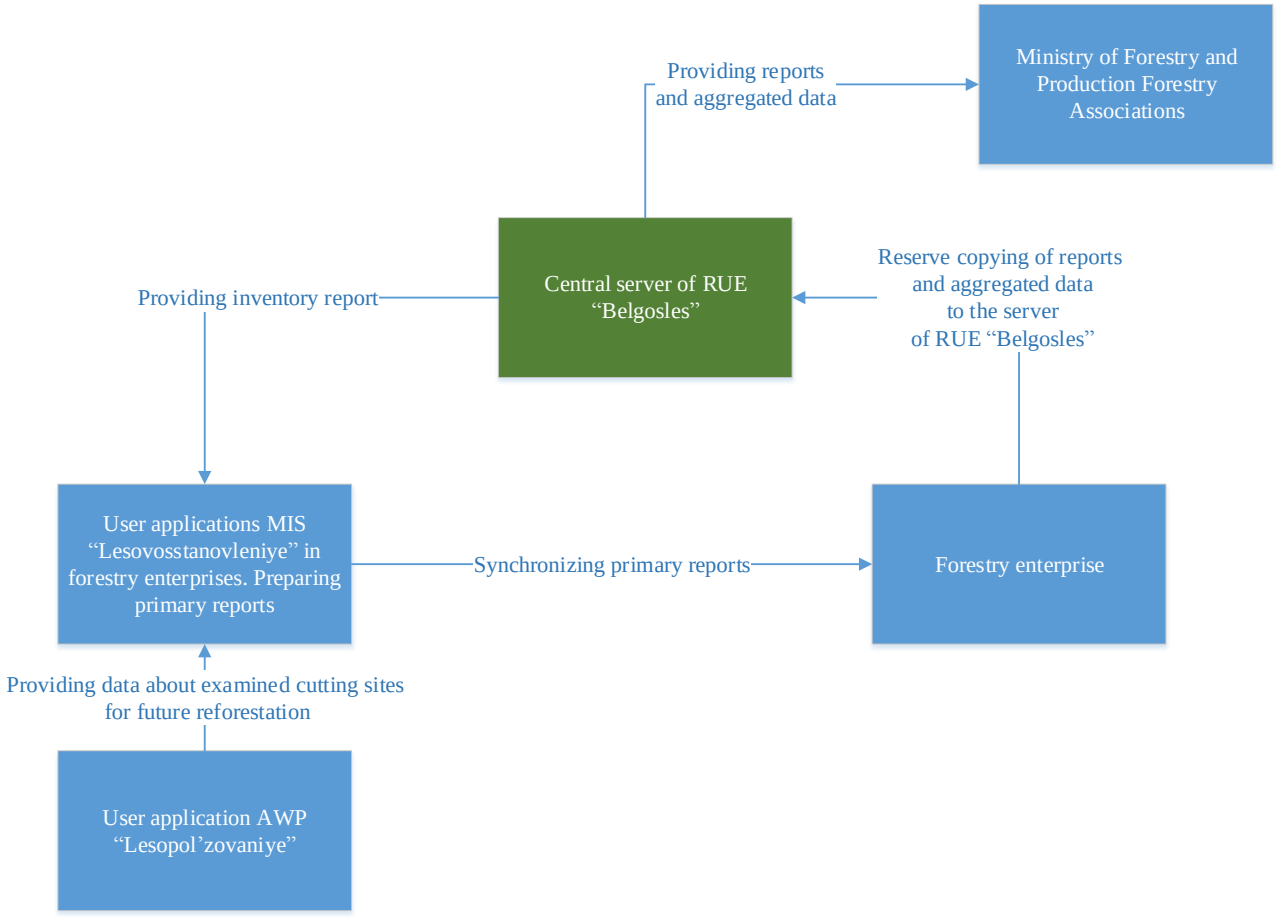


Figure 12.2 Scheme of data exchange between institutions using MIS "Lesovosstanovleniye"

13 TRIAL TESTING OF THE SYSTEM (Stages 6)

13.1 Time and place

Trial testing of the system was conducted in three forestry enterprises:

- SFE “Shchuchinskiy leshoz”;
- SEFE “Osipovichskiy opytnyy leshoz”;
- SFE “Lepelskiy leshoz”.

13.2 Goals of the trial testing

The goals of the trial testing are:

- Check workability of MIS “Lesovosstanovleniye” and its readiness for approval testing;
- Define requirements for revision of MIS “Lesovosstanovleniye” work and project documents;
- Define requirements for revision of MIS “Lesovosstanovleniye” software;
- Allow MIS “Lesovosstanovleniye” to pass approval testing.

13.3 Testing MIS “Lesovosstanovleniye” functioning

MIS “Lesovosstanovleniye” must complete functions listed in “General system description” and satisfy Requirements specifications.

The tests listed in Table 13.1 are conducted to check system functioning.

Table 13.1 Testing system functioning

№	Testing object	Task	Testing order
1	MIS “Lesovosstanovleniye”	Check if the structure and contents of the system satisfies “General system description” and Requirements Specifications	Compare real structure and contents of the database with the Paragraph 3.1 of “General system description” (“Decisions on the system structure”, “Volume, contents, structuring methods, data processing order”).
2	Data input module, data storage and management module, reference data module	Check if data can be filled in the document windows. Check if available attributes used for data input are valid. Check functions of data storage, data completeness and integrity	Open application MIS “Lesovosstanovleniye”.
			Create random document.
			Input and edit data.
			Check if set and tracked value and code combinations satisfy the requirements.
			Check content completeness and interpretation accuracy of reference books, tables and lists of allowed values used.
			Save the document.
			Restart the application.

№	Testing object	Task	Testing order
			Check the integrity of the previously saved document
			Check the integrity of the previously saved document
3	Data processing module	Check the completion of the following functions: - Prepare reports - Find available for reforestation plots	Open application MIS “Lesovosstanovleniye”
			Prepare report
			Check the report preparation accuracy
			Open window “Available plots”
			Select random attributes for update and press “update” button
			Check the accuracy available plot
4	Output data module	Check if documents and reports can be exported to MS Word	Open application MIS “Lesovosstanovleniye”
			Prepare report
			Press “Export to MS Excel” button
			Check the result
			Select a random primary report
			Press “Export to MS Word” button
			Check the result

13.4 Results of the trial testing

The following documents have been presented for the trial testing:

- Requirements Specifications for MIS “Lesovosstanovleniye”;
- General system description of MIS “Lesovosstanovleniye;
- User manual for MIS “Lesovosstanovleniye”;
- Plan and methods of MIS “Lesovosstanovleniye” testing;
- Register of the trial testing;

All the documents of MIS “Lesovosstanovleniye” have been presented on time.

Project and working documents of MIS “Lesovosstanovleniye” presented for the trial testing have the required qualities and are complete;

During the trial testing, the staff of SFE “Shchuchinskiy leshoz”, SEFE “Osipovichskiy opytnyy leshoz” and SFE “Lepelskiy leshoz” has analysed the workability of MIS “Lesovosstanovleniye”.

The system completes all the basic tests (Table 11.1) very well. Comments and suggestions appeared during the trial testing have been examined and partially applied to MIS “Lesovosstanovleniye”.

13.4.1 Suggestions on the system revision from SEFE "Osipovichskiy opytnyy leshoz"

During the trial testing, SEFE "Osipovichskiy opytnyy leshoz" has made the following suggestions for the system refining:

"Report sheet of available plots"

1. *Suggestion*. Add a column for cutting area status (completed/in process).
   Status. Applied.

Reference books of MIS "Lesovosstanovleniye"

1. Add a reference book "Stages of sodding" (small, average, great) and add corresponding columns to the documents (currently the percent of sodding can be filled in "Forest plantings plan").
   Status. Applied.

"Report sheet of technical acceptance"

1. Comment. There is no selection of sites to be filled in the report sheet.
   Status. Corrected.

MIS "Lesovosstanovleniye" functions

1. *Suggestion*. Turn off mouse scrolling when selecting available variants.
   Status. Applied.
2. *Suggestion*. Highlight elements compulsory to fill in.
   Status. Applied.

Register of reforestation and afforestation areas

1. *Suggestion*. Automatically fill elements loaded from AWP "Lesopol'zovaniye"
   Status. Applied.

13.4.2 Suggestions on the system revision from SFE "Shchuchinskiy leshoz"

During the trial testing, SEFE "Osipovichskiy opytnyy leshoz" has made the following comments on the system operation:

"Report sheet of available plots" (further – the Report sheet):

1. *Comment*. After opening the Report sheet, the forest site numeration order is incorrect.
   Status. Corrected.
2. *Comment*. When loading data from inventory report to the Report sheet, forest plantings aged from young growth to mature stands are loaded.
   Status. Corrected.
3. *Suggestion*.
   Divide window "Available plots" into two parts: "Available plots of continuous cutting and non-forest covered lands" (continuous final cuttings, continuous sanitary cuttings and continuous reconstruction cuttings, glades, wastelands) and "Available plots of selective cuttings" (all types and methods of selective cuttings, renovation and reformation cuttings).
   Note. The window "Available plots" collects all sites available for reforestation and afforestation. There are columns "Cutting type" and "Type of lands". Every column has a filter function to filter all available sites by a certain criterion including cutting type and type of lands. Thus, such function will not lead to the required effect.
4. *Suggestion*.
   When loading sites from AWP, it is rational to make the program define the forest area category ("a" – glades, wastelands; "b" – cutting sites with less than 500 stumps/ha; "c" - cutting sites with more than 500 stumps/ha; "d" – sites with partial reconstruction cuttings conducted; "e" – depleted turf pits) and add a column "Forest area category" to the Report sheet menu. Category "b" and "c" can be defined according to the number of trees in AWP "Lesopol'zovaniye".

Status. Applied.

Register of reforestation and afforestation areas (further – the Register):

1. *Comment*. Sites loaded from the TO must be represented in the Record in full form, with activities assigned by forest managers and with possibility to prepare a Statement of inventory unsatisfaction later if needed.
   Status. After examination, the change was considered unreasonable.
   Note. As MIS "Lesovosstanovleniye" interacts with outside databases, it is highly unrecommended to take the databases of the other software for truth, because possible mistakes of database entries or logical structure can significantly influence the workability of MIS "Lesovosstanovleniye". The system will automatically receive data from outside databases, but it is the user who makes the final decision to enter (and/or edit) this data or not to the primary reports.
2. *Comment*. When entering data to the "Loaded site data", it is impossible to enter site area. When selecting TSC in this form, then the TSC is displayed instead of the area and the area is not displayed at all.
   Status. Corrected.
3. *Suggestion*. When entering data to the "Loaded site data", there is no need to give all the list of forestry enterprise land types in window "Type of lands". Non-forest covered types of lands are enough (glade, cutting site, moor, field, etc.).
   Status. Applied.
4. *Suggestion*. It is inconvenient to enter the area of planned activities using ";".
   Status. Applied.

Forest plantings plan (further – the Plan):

1. *Comment*. Add an element to select the type of forest plantings plan (plan of plantation forest plantings for growing balance wood, plan of plantation forest plantings for growing large-scale wood, Christmas tree plantation plans, landscape forest plantings plans, geographical forest plantings plans).
   Status. Applied.
2. *Comment*. Add an element to select the forest area category.
   Status. Applied.
3. *Comment*. Columns 9-10 must be divided into three soil processing methods: mechanized, manual, no processing. And then mechanized method must be divided into continuous, stripe, plough etc.
   Status. Corrected.
4. *Comment*. In the column 14, the space between rows and space between saplings must be written in metres.
   Status. Corrected.
5. *Comment*. Calculation of seeding material for 1 hectare and for all the area by tree species must be absolutely automatically done taking into account the minimal number of planted saplings. Currently the following rules of the minimal number based on the TSC are valid (Appendix 3 to the Reforestation and Afforestation Regulations). If there is an attempt to plan lesser number of samplings for a hectare than minimal, then the program must not allow it. It is seen from the table that the minimal density is different for the same species and for different species. This also must be taken into account when preparing Forest plantings plan. Also, in TSC A2 and B2 it is allowed to leave some rows of birch as a secondary main species without planting, i.e. only for natural reforestation. For example, 7pP3p_ (for natural reforestation). In such case the density of forest plantings will be only 5333*0,7=3733 pcs/ha. The scheme of mixed forest plantings can consist of up to 5 different species at the same time.
   Status. Applied.
6. *Comment*. Columns 15-16 are located after columns 17-18. Such species as black locust, field elm, pear, willow, alder buckthorn, hazel, grey alder, aspen, sorbus, apple, after-

tapping pine must be excluded from the drop-down list. It is reasonable for columns with characteristics of seeding material (quality class etc.) to appear only after selection of seeding as the method of forest planting.
Status. Applied.

7. *Comment*. Column 17, window “species” must contain for names: seedlings, seedlings with closed root system, saplings, wild growing plants.
Status. Applied.
8. *Comment*. It is reasonable in columns 19-21 to automatically write the year of forest plantings transfer year as the year of planting+ 7 years. For example, for forest plantings created in 2020 it will be 2027. Also, it is reasonable to add four windows with certain years to the types and number of maintenance rounds since the year of forest plantings creation. For example, for forest plantings created in 2019 it will be 2020, 2021, 2022.
Status. Applied.

13.4.3 Suggestions on the system revision from SFE “Lepelskiy leshoz”

During the trial testing, SFE “Lepelskiy leshoz” has made the following comments on the system operation:

Register of reforestation and afforestation areas:

1. *Comment*: Add possibility to create a site directly in the Register without using window “Available plots”.
Status: Corrected.

13.5 Results of the trial testing

Trial testing of the system was conducted in three forestry enterprises (SFE “Shchuchinskiy leshoz”, SEFE “Osipovichskiy opytnyy leshoz”, SFE “Lepelskiy leshoz”).

Based on the results of the testing, comments and suggestions for the system refining has been collected. MIS “Lesovosstanovleniye” has been refined according to the comments and suggestions. According to the result of trial testing, the trial testing committee has made a conclusion that MIS “Lesovosstanovleniye” can be introduced to industrial exploitation.

14 SYSTEM REQUIREMENTS

14.1 System requirements for user computer

User computer must satisfy the following requirements

- Dual-core processor, ≥1.8Hz;
- RAM – more than 2 GB;
- Free hard drive space – more than 1 GB;

Software:

- OS Windows 7 and higher;
- MS Word;
- MS Excel;
- GIS-Les;
- Antivirus;
- Administrator ISULH.

15 SUMMARY

Information management system (MIS) was being created under the contract №BFDP/GEF/SSS/17/30-21/17 according to the rules of creation of automated systems, prescribed by the State Standard GOST 34.601.90 “Information technology. Set of standards for automated systems. Automated systems. Stages of development”.

Based on the requirements for the system listed in Requirement Specifications and the contract №BFDP/GEF/SSS/17/30-21/17, MIS “Lesovosstanovleniye” has been created and satisfies all the requirements.

APPENDIX 1

Register of areas of reforestation and afforestation

(name of forestry, legal entity in forestry)

No. Of units	Forest quarter, taxation stand, plot (cutting area)	Types of land, designed for reforestation and afforestation	Area, ha , for glades, vacant lots – Type of Forest Planting Conditions (TLU)	Felling Information										Planned measures for reforestation and afforestation (main species), ha					
				cutting area characteristics before cutting					information on logging according to survey										
				Forest cutting number, year of felling	Area, ha	Composition of felled tree stands	Type of forest, Type of Forest Planting Conditions (TLU)	Number of undergrowth of valuable species, ha , thou. pcs. / ha	cutdown, ha		number of surviving undergrowth (thou. units / ha), composition, height, age	remaining seeds, pcs / ha , species				natural forest regeneration		
									Total	incl. undergrowth preserved			Forest crops	Preservation of undergrowth at felling of main use logging	Accompanying reforestation in incomplete felling of main use logging and felling of logging renewals	without assistance	with assistance	Transfer to another form of land
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Course and results of reforestation and afforestation									
forest crops			preservation of undergrowth during main-use logging (area of transfer of plots to forested lands, main species, document, date); in case of insufficient undergrowth - the same plus planned activities	Accompanying renewal in case of incomplete logging and renovation logging (area of transfer of plots to forest covered lands, main species, document, date); in case of insufficient undergrowth - the same plus planned activities	Assisting to natural forest regeneration				Natural regeneration of forests (area of transfer of land plots to forested lands, main species, document, date); in case of transfer to other types of land - area, document, date
bookmark season and year	area, ha , main species	transfer of plots to forested lands (area, main species, document, date); in case of death of forest crops - the same plus planned activities			year of works	method of assistance	area, ha	transfer to forest covered lands (area, main species, document, date); in case of writing off - the same plus planned activities	
20	21	22	23	24	25	26	27	28	29

APPENDIX 2

Inspection/ survey report on forest fund designated for reforestation and afforestation

Legal Entity, Leading Forestry _____

Forestry _____

Forest Quarter	Taxation plot	Area, ha		Characteristic plot of the forest fund					Method of reforestation and afforestation
				Types of forest planting conditions	Main tree species	Natural regeneration of main tree species at the age of two+ with a height of at least 0.1 m (number, composition)	Uniformity of distribution of undergrowth of tree main species	Assessment of emergence of new tree natural generation of main species	
1	2	3	4	5	6	7	8	9	10
			Forest inventory project						
			According to survey results						

APPENDIX 3

Statement of technical acceptance of forest crops in Year ____

Season _____ in _____ forestry _____

(spring, autumn) (legal entity in forestry)

No.	Forest Quarter	Taxation plot	Area, ha		TUL and type of forests	Crop area category	Method of tillage	Main species, composition of forest crops	Placement of cultivated crops	Forest crops cultivated by, ha								Actual seed consumption, kg	Number of planting places per 1 ha, pcs.			Percentage of planting places, ±	Major work defects	General assessment of the quality of works	Forestry mark	
			Total	Incl. forested lands						Planting	Sowing	Manually	Mechanisms	Plantlets	Seedlings	with closed root system	Selected seed material		under the project	Under the actt	Under technical acceptance				area, ha	Quality
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

APPENDIX 4

FOREST CROPS PROJECT

Project _____

for _____ *year*

_____ _____

(legal entity in forestry)

forest quarter number _____ taxation number _____

type of planting to be produced _____

Site map M 1:10 000

<IMAGE>

1. Land area _____ ha .

1.1. In areas of radioactive contamination: density of soil cont. with cesium-137 ____ Ki / km2; gamma dose rate _____ _____ μSv / h; permissible operating time: in open area _____ h / year, for equipment ____ h / year

2. The category of forest cultivated area (felling: condition of cleaning, number of stumps per 1 ha, cinder - years, wasteland, open (thin) stand, glade, etc.)

_____

3. Relief _____

4. Soil and its moisture degree _____

5. Soil cover (the most important indicator plants), degree of soil sodding

_____

6. Type of forest or type of habitat _____

7. The presence of natural regeneration (per 1 ha, species composition, location)

_____

8. Forest pathological characteristics of the forested area (degree of infection with the larvae of chrysalis, other pests and diseases, presence of foci of the root sponge in the past, etc.) and recommended forest protection measures

_____

9. Methods and time of tillage (mechanized, manual, continuous, in strips, furrows, terracing, platforms, etc.), depth of processing or height of microelevations (strata, shafts, hills)

_____

10. Placement of sites, terraces, stripes, furrows _____

11. Composition, age, completeness of regenerated stands

_____

12. Regeneration method (corridor: width of corridors, links; group: sizes of holes, their number per 1 ha; continuous) _____

13. Method and way of crop production (planting, sowing: ordinary, row-hole, manual, mechanized, types of vehicles)

_____

14. Distance between rows and in rows, number of planting (sowing) places per 1 ha, throughout the area _____

15. Scheme of mixing crops _____ **16.** Main crop _____

17. Characteristics: of seed material (seed quality class and selection category), planting material (species, age, selection value)

_____

18. Method of preparing seeds for sowing, seedlings for planting

_____

19. Types and volume of care by year _____

_____

20. Fire prevention measures (size of plots, width of fire breaks, etc.)

_____

21. Year of transfer of crops to forested land _____

22. To perform the works it is necessary: for sowing _____ kg of seeds per 1 ha, forests _____ kg for the total area, including by crops _____

for forest planting _____ pcs per 1 ha _____ pcs for the total area including crops _____

The forestry project was developed by a forester _____ _____

(signature) (name)

date _____

The following changes and amendments are introduced in the project _____

_____

_____

The forestry project was checked and agreed by a reforestation specialist

_____ _____

(signature) (name)

date _____

APPENDIX 5

Passport of artificial planting of forest crops

Year of forest crop production _____ , forest sq . ___ , taxation plot ___ , area ____ ha .
(spring, autumn, year)

Plot characteristics _____

Forest type _____ type of forest planting conditions _____

relief _____ , soil _____ cover _____

natural regeneration availability _____
(quantity by crops)

Site map M 1:10 000

<IMAGE>

Period and method of tillage _____

Mixing and placement scheme _____ , forest crop production method _____
(sowing, planting, main species)

Number of planting places per 1 ha by crops _____

on a plot by crops _____

Characteristics of seed and planting material

_____
(to indicate the origin and selection group of seeds)

Crop care (area, date, certificate number):

The survival rate of crops according to the inventory:

Addition:

Plot area of crops transferred to forested lands _____ ha , density _____

composition _____ field card No. _____ dated *year* _____

Taxation characteristics of plantation

Year of current changes in taxation indicators	Rationale for current changes in taxation indicators	Number of forest quarter	No. of taxation plot	Area,ha	Composition	Age, years	Density	Total stock, m3		Cutdown wood, dense m3				
											including			
								Per 1 ha	On plot	total stock	business	wood fuel	total of liquid wood	illiquid
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Total														
from 1 ha														

APPENDIX 6

Field card No. _____ , code _____
for forest crops inventory _____

1. Legal entity in forestry _____
2. Forestry _____
3. Forest quarter _____ taxation plot _____
4. Type of forest planting conditions _____
5. Plot area _____ ha . 6. Production method _____
7. Main crop _____ 8. Mixing scheme _____
9. Location _____ m , the number of planting (sowing) places per 1 ha _____ pcs
10. Length of planting (sowing) rows per 1 ha _____ m
11. Survey results:

Sample numbers	Sample size		Crop	With accounting of	
	m2	long meter		surviving	dead
1	2	3	4	5	6
Total for samples					
In terms of 1 ha	10,000				

12. Survival _____ %
13. Reasons for decline _____
14. Assessment of forest crops, compliance with standards and specifications recommended actions

_____

APPENDIX 7

Field card for forest crops inventory
of Year 7 No. _____

_____

1. Legal entity in forestry _____
2. Forestry _____
3. Forest quarter _____ 4. taxation _____
5. TLU, type of forest planting _____ 6. Type of planting _____
7. Planting year _____ 8. Plot area _____
9. Mixing scheme _____ placing plants in rows _____ m , between rows _____ m
10. Number of plants planted per 1 ha _____ pcs.
11. Condition of plantings according to the survey:

Number of trial areas	Size of the trial area , m2	Crop	Cultivated viable and natural regeneration of main tree species, pcs.	Average height of cultivated plants and natural regeneration of main crops, 0.1 m	Regulatory indicators of cultivated species for TUL data in this age		Degree of closure of forest crops and natural regeneration of major species when transferred to forested lands,%		Quantity of regenerated soft-leaved species, pcs.	Top height of regenerated soft-leaved species, 0.1 m	Exceeding of the height of main species by soft-leaved species, ± 0.1 m
					quantity, thou. pcs.	height, m	in a row	in row spacing			
1	2	3	4	5	6	7	8	9	10	11	12

12. Conclusion of the sub-commission:

a) assessment of forest crops: sufficiency of the number of the main species in comparison with the normative number, the uniform distribution of the main species over the area, the ratio of heights of the main and minor species:

b) forest crops are subject to transfer to forested lands, composition _____

c) proposed measures to improve the condition of forest crops

d) a re-examination deadline has been set _____*year*_____

APPENDIX 8

Field card No. _____
for the survey of forest crop areas on forested lands transferred to another group of crops based on cultivated tree species

in *year* _____

1. Legal entity in forestry _____
2. Forestry _____
3. Forest quarter _____ taxation plot _____
4 . Plot area _____ ha. 5 . Type of forest planting conditions _____
6. Group of crops _____
7. Type of forest crops _____
(reconstruction, under the forest canopy)
8. Main crop _____
9. Results of eye taxation:
   a) composition
   b) average height of crops
   c) closeness of crops in the rows
   d) average height of soft-leaved species
   d) average diameter
   e) density
10. Conclusion of the forestry sub-commission on
a) plot of forest crops created _____
(indicate - reconstruction or under the forest canopy)

to be transferred to _____ crop group
taxation characteristics _____
b) measures to improve the condition of forest crops are required

_____
c) re-examination in *year*

APPENDIX 9

Write- off certificate for forest crops that died from natural disasters

We, members of the commission: representatives of _____
(legal entity in forestry)

_____
(position, name)

and representatives of the emergency commission of _____ district

_____
(position, name)

drafted this certificate to note that as a result of natural disaster

_____
(indicate the type of natural disaster)

that occurred from _____ till _____

in _____ district, the forest plantations in

_____ forestry, were killed in the area _____ ha

with the expenditure for growing them

in the amount of _____ thousand BYN.

As a result of the onsite inspection and the accounting of forest crops, the commission recommends the following plots to be written-off:

Location of plot (number of forest quarter, taxation plot)	Season and year of planting	Area, ha	Main crop	Method (way) of production	Survival rate,%		Spent thou.BYN
					per year of production	after natural disaster	
1	2	3	4	5	6	7	8
Total							

APPENDIX 10

Write-off certificate for failed forest crops

We, members of the commission of _____
(legal entity in forestry)

_____
(position, name)

_____

with participation of _____ drafted this certificate to note that that after the inventory of forest crops planted by _____ forestry, there are dead crops of _____ ha with the expenditure for growing them in the amount of _____ thousand BYN.

As a result of the onsite inspection and the accounting of forest crops, the commission recommends the following plots to be written-off:

Location of plot (number of forest quarter, taxation plot)	Season and year of planting	Area, ha	Main crop	Method (way) of production (assistance measures)	Survival rate,%	Causes of death	Good for planting (yes/ no)	Spent thou.BYN
1	2	3	4	5	6	7	8	9
Total								

APPENDIX 11

List of sites designed for implementation of actions to assist natural regeneration in ____ *year*,

in _____ forestry _____

(legal entity in forestry)

No.	Forest Quarter	Taxation plot	Area, ha	Plot characteristics (felling, burning, year of felling, fire; for planting: composition, age, density)	Type of forest, TLU	Natural regeneration	Soil cover (grass, mosses), degree of soil sodding)	Seeding sources	Degree of soil mineralization,%	Crop	Planned measures to promote natural regeneration of forests (name)	Including by type of works			
												Soil mineralization, %	Fencing, length, m	Sowing seeds (by species), kg	Planting seedlings, plantlets (by species), pcs.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TOTAL															

APPENDIX 12

List of sites designated for natural regeneration in _____ *year*

in _____ forestry _____
(legal entity in forestry)

No.	Forest Quarter	Taxation plot	Area, ha	Type of land, uncovered and non-forest (deforestation: year of felling, condition of clearing; cinder: year; other types of land - their name: redwood, glade; fallow, former pasture grassland; depleted peatland, etc.)	Type of forest, TLU	Bonitet	Main crop
1	2	3	4	5	6	7	8
TOTAL							

APPENDIX 13

Data on natural regeneration of forests

1 . Natural regeneration of forests without assistance measures was assigned in _year_

The promotion of natural regeneration of forests has been carried out in _year_

2 . Forest quarter number _____ , taxation number _____ , area __ ha.

3 . Type of land not covered by forest or non-forest _____

4 . Bonitet _____ type of forest _____ TLU _____

5 . Characteristics of stands with the assistance of natural regeneration under the forest canopy: composition _____ age _____ years old, density __

Site map M 1:10 000

< IMAGE >

6 .Year of cutting ____ the width of the cutting area __ m

cutting method _____

method and term of adjoining the cutting area

_____ cleaning method

_____

7 .Year of burn. __ type of wildfire ____

8 . Way to assist natural regeneration of forests _____

9 . Availability of seedlings (species, number per 1 ha, location) _____

10 . Tree species _____

11 . Regenration accounting results:

11.1 . date of the first examination

number of plants by crops per 1 ha and their height _____

composition and age by crops _____

closeness (density) _____

Conclusion: regenration assessment ___ ; transfer to forested land _____ ha for the main crop _____ ;

the actions to be assigned _____ ;

to hold re-examination in _year_ ;

11. 2 . date of the second examination ____ , number of plants by crops per 1 ha and their height _____ , composition and age by crops _____ , closeness (density)

_____

_____

Conclusion: regenration assessment _____ ; transfer to forested land _____ ha for the main breed _____ ;

transfer to other land categories _____

(type and reasons)

APPENDIX 14

Field card No. _____

of inventory *year*

of assisting forest natural regeneration, with preservation of undergrowth of major tree species during clear cutting, accompanying forest regeneration during non-continuous clear-cutting and main cutting

(underline the activity)

1. Forestry _____

2 . Forestry area _____

3 . Forest Quarter _____ taxation _____ , plot area _____ ha.

4 . The taxation characteristics of the plot: felling *year* , with assistance under the canopy forests indicate the composition of the plantation _____ age _____ , density _____ ;
for other lands - their type _____

5 . Forest type _____ **6** . Year of assistance _____

7 . Method for assisting natural forest regeneration _____

8 . Results of accounting of regeneration (details are filled in when plantings are set up):

Numbers of accounting sites	Size of accounting sites	Crop	Number of plants	Including main crops by height groups			Average height of secondary species, m	Relative density
				up to 0.5 m	from 0.6 to 1.5 m	over 1.5 m		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

9 .Composition _____ age _____ years old.

10 . Occurrence of major tree species _____ %

11 . Excess of coniferous and hardwood species by secondary species _____ m

12 . Conclusion of the sub-commission:

a) assessment of natural regeneration _____

b) transfer to forested land _____ ha by _____ main crop;

c) actions to be assigned _____

g) to hold re-accounting in *year* .

13. Note of the commission on the inventory quality control _____

_____

_____

APPENDIX 15

List of inventory sites for natural regeneration without assistance actions in ____ *year*

1. Legal entity in forestry _____ 2. Forestry _____

No.	Forest quarter , taxation plot	Area, ha	Course of natural regeneration , ha					Number of plants per 1 ha, average height, m	Transferred to forested land		Actions required	Information on acceptance, cession or transfer to other types of land, including creation of forest crops (rationale)	Note of the inventory quality control
			There is a natural regeneration of				No natural regeneration		composition	area ,ha			
			Main trees	Low value crops	Mix of major trees and low value crops	total							
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total													

APPENDIX 16

List of technical acceptance of works to assist forest natural regeneration in _____ of

Season _____ in _____ forestry _____

(spring, autumn) (legal entity in forestry)

No	Forest quarter	Taxation plot	Plot area , ha		Method (way) of regeneration	Volume of natural regeneration per 1 ha, thousand pcs.	Crop	Share of cultivated soil in the plot area,%	Length of fencing, m	Sown seeds per 1 ha, kg	Planted plantlets (seedlings) per 1 ha / plot, thou. pcs.	Discrepancy between the planned and performed works	General assessment of works (good, satisfactory, unsatisfactory)	Forestry commission note on inspection (quality and comments)
			total	including forested lands										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Total														

APPENDIX 17

Report on the survival rate of forest crops

Name of the reporting entity

Type of planting

Crop	Crop code	Forest planted, ha		Inventory , ha		died, ha of the total number of the inventory made	Forest crops survived, ha	Survival rate of surviving forest crops,%	Area of forest plantations, requiring additions
		Total	incl. by sowing	Total	incl. seedlings				
1	2	3	4	5	6	7	8	9	10
Local conifers	001								
incl. common spruce	002								
European larch	003								
ordinary pine	005								
introduced conifers	006								
Total of conifers	**048**								
Local broadleaved	049								
incl. pedunculate oak	058								
holly maple	064								
black alder	067								
common ash	074								
silver birch	088								
Introduced broadleaved crops	086								
Total of broadleaved crops	**149**								
Total of forest crops	**500**								

APPENDIX 18

Consolidated report
inventoried in ___*year*___ **of forest (plantation) crops**
and protective forest plantations _____

1. _____ *(forestry)*

2. _____ *(forestry area)*

3. Type of planting: _____

4. Main crop: _____

5. Production method: _____

No. of field cards	Location of plot (No. of quarter, plot, agricultural enterprise)	Area of forest crops, ha	incl. planted with seedlings, ha	Died, ha.	Preserved, ha.	Survival rate, %	Gr.6 x gr.7	Area of crops requiring addition, ha.	Causes of death	Crop assessment
1	2	3	4	5	6	7	8	9	10	11
Total:									**x**	**x**

APPENDIX 19

Consolidated report
inventoried in ___*year*___ **of forest (plantation) crops**
and protective forest plantations _____

1. _____ *(forestry)*

2. _____ *(forestry area)*

3. Type of planting: _____

4. Main crop: _____

5. Production method: _____

No. of field cards	Location of plot (No. of quarter, plot, agricultural enterprise)	Area of forest crops, ha	incl. planted with seedlings, ha	Died, ha.	Preserved, ha.	Survival rate, %	Gr.6 x gr.7	Area of crops requiring addition, ha.	Causes of death	Crop assessment
1	2	3	4	5	6	7	8	9	10	11
Total:									**x**	**x**

APPENDIX 20

Consolidated report on technical acceptance of forest crops, protective forest plantations

as of _____

(spring, autumn)

Name of the reporting entity

(accuracy - in full hectares)

Area, ha		Main crop	Production method, ha		Number of planting (sowing) places per 1 ha, pcs.	Acceptance results, ha		Major defects of works	Inspected by the forestry		Comments
Total	incl. on forest covered lands		planting	sowing		good, satisfactory	unsatisfactory		area, ha	quality	
1	2	3	4	5	6	7	8	9	10	11	12
		x						**x**		**x**	**x**

APPENDIX 21

Consolidated forest crops production project

by

No.	No. of quarters (natural plots)	Land plot	Forest crop category	Type of planting condition.	Natural regeneration per 1 ha by crops	Planned area of forest crops, ha		inc . by method of soil preparation, ha			Way to create forest crops				Scheme of mixing the crops with distances in a row and between rows	Number of planted or sown areas per 1 ha	Number of planting or sowing material per 1 ha, pcs	Cost of sowing and planting material				Planned forest care					
											sowing		planting							quantity, pcs		year		year		year	
						in the forest fund	for agriculture under agreement	mechanized.	manual	without processing.	mechanized.	manual	mechanized.	manual				crop	age of planting material	per 1 ha	for the total area	number of care actions	volume of works, ha	number of care actions	volume of works, ha	number of care actions	volume of works, ha
																						-	-	-	-	-	-
Total:			-	-	-		-		-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX 22

Register of natural regeneration of forests

in _____ forestry

_____

of _____ region

Indication of plots of natural forest regeneration

No. of registry pages	Location of the plot (name of the tract or quarter number, plot number)	Plot area, ha	Year of designating the plot for natural regeneration without assistance	Year of natural forest regeneration assistance	Regeneration accounting results			
					first examination		second and following examinations	
					year and regenration rating, main crop	plots transferred to forested land (ha), activities and year of re-examination	year and regeneration rating, main crop	plots transferred to forested lands or other types of land (ha)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

APPENDIX 23

(name of the republican governmental forestry agency

in the field of forest use, protection and reproduction)

Register of land accounting with actions taken to assist natural regeneration

for legal entity in forestry, _____
of ____ region

Year and season of works	Number of forest plot, taxation plot	Area, ha	Land plot characteristics: forest type, TLU; for planting - composition, age, density; for felling and fires - type of land, year of felling, fire	Measures taken to assist natural regeneration of the forest				Accounting results				
								1st accounting				
				soil mineralization % of the total area	fencing, length, m	sowing seeds (by crops), kg	planting seedlings, plantlets (by crops), pcs.	year of accounting	examined area	transferred to forested land main crops	regeneration by trees of the main crop is not finished	written off
1	2	3	4	5	6	7	8	9	10	11	12	13

Accounting results										Note
2nd accounting					3rd accounting					
								written off		
year of accounting	examined area	transferred to forested land main crops	regeneration by trees of the main crop is not finished	written off	year of accounting	examined area	transferred to forested land main crops	transferred to the land covered by forest softleaved species	transferred to the land covered by forests of softleaved species	
14	15	16	17	18	19	20	21	22	23	24

Register of forest crops production (protective plantations, shelterbelts)

_____ forestry

_____ of ___ region

Part I: Area and condition of forest crops by years of production (accurate to 0.1 ha)

No.	Year and season of forest crop production	Location of cultivated plot, quarter number, plot, type of forest planting conditions	Forest area		Method of tillage	Method of production		Main crop	Planting density per 1 ha, pieces; for sowing: layout of sown areas, seed quality class,	Characteristics of planting or seed material	Survival of preserved crops according to		Forest crops accepted		Transferred forest crops		Written off forest crops			Transferred to forested land		Note
			Total	Including forested land		sowing	planting				First inventory	Second inventory	Total	Including created, forested	Total	Including those created on forested lands	Total	Including forested	Reasons for writing off, No. and date of certificate	Field Card No., date, area	Taxation characteristics of the plot	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Part II: Transfer of forest crops to forested lands (accurate to 0.1 ha)

Year of accounting	Crops of the year											
	Planted crops (according to the report) - total	Including forested land	Written-off crops		Forest crops accepted		Transferred forest crops		to be transferred to forested lands - total	transferred to forested land	Remaining crops not transferred to forested lands	
			Total	Including forested land	Total	Including forested land	Total	Including forested land			Total	including those not transferred in due time
1	2	3	4	5	6	7	8	9	10	11	12	13

APPENDIX 25

Register of passports of artificial plantations

_____ forestry
_____ region

Indication of crop sites by years of works

Registry page number	Year of crop production. Location of the plot (name of the site or quarter number, plot number)	Sowing in hectares		Planting in hectares		Total
		Main crop		Main crop		
			Total		total	
1	2	3	4	5	6	7

APPENDIX 26

Consolidated list of the transferred plots with preserved undergrowth during clear-cutting operations, with accompanying reforestation as a result of incomplete clear-cutting and main cutting

Name of the reporting entity

(accuracy - in full hectares)

Year of planting forest crops	Forest crops created by partial regeneration and under the forest canopy	Accepted to the forest fund	Transferred from the forest fund	Entered into the category of valuable tree plantations		Written-off forest crops		Remaining forest crops not included in the category of valuable tree stands	
				Total	incl. in the reporting year	Total	incl. in the reporting year	Total	incl. at the age of 7 and older
1	2	3	4	5	6	7	8	9	10
Total:									

APPENDIX 27

Report on entry of forest stands into the category of valuable forest stands for ___ *year*

Name of the reporting entity

Line number	Name of forest stands introduced into the category of valuable forest plantations	Young growth area - total	Incl. valuable forest plantations
A	B	1	2
01	Total		
Including due to the plots:			
02	forest crops on clearings and on non-forested lands		
03	forest crops created by the group and corridor methods of regenerating low-value forest plantations and under the forest canopy		
04	with measures taken to assist natural forest regeneration		
05	with the undergrowth of trees of the main species preserved and the natural regeneration of forests resulting from the use of discontinuous (gradual and selective) clear-cutting and main logging cutting		
06	designated for natural regeneration of forests without assisting actions		
07	with thinning and cleansing carried out in naturally formed soft-leaved forest stands		

APPENDIX 28

Consolidated list of transfer of plots for natural regeneration to the forested lands for ___ *year*

_____

Name of the reporting entity

_____

Type of plantings

(accuracy - in full hectares)

Year of planting forest crops	Total of forest crops planted according to report	Forest crops accepted - total / incl. partial regeneration and underplanting (under canopy)	Of the total area of forest crops by the method of partial regeneration and underplanting	Forest crops transferred to forested lands		Written off forest crops in previous years in the year of accounting		Remaining forest crops not transferred to forested lands	
				Total	incl. in the current year	Total	incl. planted by partial regeneration and underplanting	Total	incl. at the age of 7 and older
1	2	3	4	5	6	7	8	9	10
Total:									

APPENDIX 29

Reforestation report with actions taken to assist natural forest regeneration per year

Name of the reporting entity

Way to assist natural forest regeneration

(numerator - total, denominator - under the canopy, in full hectares)

Year of natural forest regeneration assistance	Assistance area according to the report	Accepted	Transferred	Transferred to forested land				Written off		Remaining crops not transferred to forest covered lands	
				Total	Including this year	Of all valuable crops	Including this year	Total	Including this year	Total	Incl. under the forest canopy
A	1	2	3	4	5	6	7	8	9	10	11
Total:											

APPENDIX 30

Consolidated list of the transferred plots in ___ (*year*) with preserved undergrowth during clear-cutting operations, with accompanying reforestation as a result of incomplete clear-cutting and main cutting

_____

Name of the reporting entity

(accuracy - in full hectares)

Felling area according to survey of felling sites	Inventoried	Transferred to forest covered land, main species, total	From all:					Measures to increase regeneration of the main crops are planned.	Written off areas of the preserved undergrowth and accompanying regeneration
			Transfer is carried out for the first time	Transferred after compaction measures carried out					
				Total	including in: *				
					20___	20___	20___		
1	2	3	4	5	6	7	8	9	10
1. Preservation of undergrowth during main use clear-cutting									
2. Accompanying reforestation as a result of the use of incomplete main use logging									
3. Accompanying reforestation as a result of plantations cutting									
Total for 1-3									

* - columns can be added if necessary

APPENDIX 31

Consolidated list of transfer of plots for natural regeneration to the forested lands in (*year*)

_____

Name of the reporting entity

(numerator - total, denominator - under the canopy, in full hectares)

Felling area according to survey of felling sites	Inventoried	Transferred to forest covered land, main species, total	From all:					Measures to increase regeneration of the main crops are planned.	Written off areas of the preserved undergrowth and accompanying regeneration
			Transfer is carried out for the first time	Transferred after compaction measures carried out					
				Total	including in: *				
					20 - ____	20 ____	20 ____		
1	2	3	4	5	6	7	8	9	10
1. Preservation of undergrowth during main use clear-cutting									
2. Accompanying reforestation as a result of the use of incomplete main use logging									
3. Accompanying reforestation as a result of plantations cutting									
Total for 1-3									

* - columns can be added if necessary