Impact of information resource reliability on forestry economy and management

V Petrov*, I Filinova and A Bespal'ko

Institute of Forest Business and Innovation, Federal State Budgetary Educational Institution of Higher Education Saint-Petersburg State Forest Technical University, 5 Institutskii Lane, Saint Petersburg 194021, Russian Federation

*Corresponding email: wladimirpetrov@mail.ru

Abstract One of the conditions for effective forest management is the availability of reliable information about forests. The huge forest areas of Russia, the presence of reserve forests, a small number of forestry workers and a lack of funding are the main reasons for poor quality information on forests. The quality of information on forests has an impact on the forest economy, the economic performance of the forest business and government revenues.

1. Introduction
Forests are an object of management, the main factor of production, a place of production and biological processes, a source of income for the state and the profit of the forest business. Reliable and up-to-date information about forests is a condition for effective public financial management, forest planning and forestry. However, inaccurate and outdated forest information does not always have a negative impact, errors and inaccuracies in forest information sometimes have a positive impact on financial results.

2. Methods and Materials
The study used theoretical research methods: analysis of the actual data of forestry regional departments, official statistical sources, the results of scientific research of the Department of Forest Policy, Economics and Management of the St. Petersburg State Forestry University; statistical methods: summary and grouping of data, calculation of generalized indicators, sampling method.

3. Results and Discussion
Effective management of any object is impossible without complete and reliable information about this object. Currently, the collection and processing of information about forests is carried out using modern information technologies and methods. The number and qualifications of workers involved in collecting information about forests are of great importance.

Reliable and complete information about forests helps to reduce information risks in forestry. However, large areas of forests, a small number of forest workers (38000 hectare per person), the unpredictable impact of natural factors does not completely eliminate the risk of obtaining inaccurate and incomplete information about forests. Ideally, such information should be constantly updated and supplied to the governing bodies continuously. Under the current conditions, the probability and uncertainty of the occurrence of forest information risk remains high.
Actions or events are the source of forest information risk. Actions occur through the fault of a person, events are objective in nature, associated with natural phenomena (forest fires, forest pests, etc.).

Forest information risk is the likelihood of receiving incomplete and inaccurate information about forests as a result of any action or event.

The reliability of information resources can be represented in the form of dependence (1): Effective management of any object is impossible without complete and reliable information about this object. Currently, the collection and processing of information about forests is carried out using modern information technologies and methods. The number and qualifications of workers involved in collecting information about forests are of great importance.

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The reliability of information resources can be represented in the form of dependence (1):

\[ Q = f(N, K, G, W, ...) \]  

where, \( N \) – sample size; \( K \) – qualification of taxisers and forest managers; \( G \) – accuracy class of measuring instruments and equipment; \( W \) – conditions (legislative, organizational, financial, etc.) for obtaining information.

The value of \( Q \) is related to the probability of occurrence of errors \( P \) (2) in the forest information system during forest management as follows:

\[ Q = 1 - P \]  

Information about forests can be viewed as an independent renewable resource intended not only for use in forestry and forest management, but also as an increment of knowledge about forests.

The forest economy of Russia can be considered in two aspects: the economy of the government sector and the economy of the private sector. The sector of the illegal economy is not covered in the article.

Information can be fully considered as one of the factors of production in addition to capital, labor and land.

In the field of forest relations, the object of management is forests, and more often forest areas, in respect of which forest inventory has been carried out. According to official data, the lands of the forest fund over the past years have made up 66-67% of all lands in Russia [1] (figure 1). In 2015, the area of the forest fund increased by 0.33% due to the transfer to its structure of wooded lands, which were previously in the permanent (indefinite) use of agricultural organizations (figure 2).

Federal law stipulates that the lands of the forest fund are in federal (state) ownership. To make informed operational decisions and plans, information is needed not only on the state of the forest fund lands, but also on the activities of its owner and designated authorities: the Government of the Russian Federation, federal executive bodies of the Russian Federation and constituent entities of the Russian Federation. The summary information on forests is concentrated in three departments: Rosleskhoz, Rosstat and forest designated authorities in the regions.

There is an opinion that under the conditions of private ownership of forests, the accuracy of information about forests is higher, but this is a controversial opinion [2].
The significant extent of the forest fund lands leads to the fact that it is impossible to obtain and process information about forests without the involvement of specialized organizations. Federal ownership of forests on the lands of the forest fund determines the use, possession and disposal of information about forests by state authorities in the field of forestry relations.

Information about forests is contained in the state forest register. This register is a documented collection of information about the state of forests, about their use, reproduction, protection and security.

Information about forests, formed at the expense of the state budget, is federal property. Interested persons have the right to request information contained in the state forest register. Citizens, legal entities, public authorities and local self-government bodies can act as stakeholders. An extract from the register is provided to public authorities and local self-government bodies free of charge, the rest of the interested parties are charged a fee [3].

Information provided to interested parties from the state forest register [4] can be divided into primary:

- on the composition of forest lands, the composition of lands of other categories on which forests are located;
- on the quantitative, qualitative and economic characteristics of forests and forest resources (forest area and timber reserves in them by the prevailing species of forest plantations and age groups (by forestry, constituent entity of the Russian Federation, by types of designated forest use);
and secondary:

- about forest districts, their forest quarters and forest inventory allotments (forest area of
  foreстries; forest area of district foreстries within foreстries);
- the number of forest quarters and forest inventory allotments in forest districts, district forest
  districts);
- about protective forests, about their categories, about commercial forests, about reserve
  forests;
- about specially protected areas of forests, about zones with special conditions for the use of
  territories;
- about forest areas (location, type of permitted use of forests, information on the state
  registration of a forest area as part of forest lands, information on the qualitative and
  quantitative characteristics of the forest area);
- on the use, protection, security, reproduction of forests (a list of types of permitted use of
  forests in forestry in accordance with the forest plan of the constituent entity of the Russian
  Federation and forestry regulations);
- a list of the forestry plan of the constituent entity of the Russian Federation, forestry
  regulations of the forestry and the measures taken for the reproduction of forests and
  afforestation, for the protection and security of forests);
- on the provision of forest plots to citizens, legal entities (last name, first name, patronymic of a
  citizen, name of a legal entity using a forest plot, type of use of a forest plot, type of right to
  use a forest plot, period of use of a forest plot, location of a forest plot).

As can be seen from the list, the amount of primary information is much less than the amount of
secondary information. But the cost of obtaining primary information is hundreds of times higher than
the cost of producing secondary information.

The basis for determining the cost of information provided to interested parties should be taken into
account information about the costs of forest management and other works, as a result of which
information was obtained, the amount of information requested, its consumer properties and the
prevailing conjuncture.

The practice of forestry relations has shown that the current level of completeness and reliability of
information about forests is of poor quality. Lack of quality information leads to conflict situations
between the state and private business. The economic reflection of this conflict is the emergence of
unaccounted volumes of timber, distortion of cost accounting and pricing.

Over the past decades, the Department of Forest Policy, Economics and Management has been
working on assessing the economic consequences of inaccurate information about forests.

The results of the study showed that in order to effectively manage real estate - forest plots - it is
necessary for each of them to have quantitative and qualitative information: physical characteristics of
the property, legal status, economic indicators (cost, maintenance costs and profitability) and the state
of its natural environment.

The scientific problem is to justify the deviations of economic indicators (costs and benefits) from
the accuracy of information about forests. Information about forests at different stages is formed in
accordance with the relevant instructions. Each of them officially provides an error in the final
information on forest stock or timber volume (table 1). As an example, consider the step-by-step
process of obtaining information about forests. For the purposes of the study, we will single out three
main stages: forest inventory, forest inventory and determination of the volume of wood when
removed from the cutting area. Each stage includes officially established errors (table 1).

Let's briefly reveal the content of each stage:
- taxation and allotment of forest plots for use;
- forest inventory - collection of information for the formation of the state forest register;
- determination of the volume of a consignment of timber during removal by a timber truck.
The greatest influence on the information on the qualitative and quantitative state of forests is exerted by the permissible error for the results of forest management. Depending on the method of forest management and permissible random errors, the error for the final indicators can be ± 15 - 30%. In the calculations, the results of which are presented in table 2, an error of ± 15% was applied, since it is typical for forest management methods that are used in the forests of the Leningrad region.

The accuracy of information on forests affects the efficiency of the loggers and the amount of forest revenue for the state. The calculation results for the example of the Leningrad region are presented in (tables 2, 3). The state (forest owner) sets the rent based on the available information about the forests. The share of rent in the structure of the cost of timber harvesting is about 10%. The error in determining the stock affects the amount of rent and the efficiency of the logger. The efficiency of loggers with an error of "± 15%" is on average three times higher than the error of "-15%". Table data 2 and 3 are calculated for the conditions of the Leningrad region.

### Table 1. Measurement accuracy by stage (forest stand-timber-timber transport).

| Indicator | Allocation and taxation of the cutting area [6] | Report on the use of forests [7] | Accounting for a lot of timber per machine (15–60 m³) [8] | Determination of the volume of timber lots [9] |
|-----------|-----------------------------------------------|---------------------------------|----------------------------------------------------------|------------------------------------------------|
| ± 15 – 30 % | ± 10 – 15 % | accuracy to one decimal place, cbm | ± 12 – 15 % | accuracy to 2 decimal places, cbm |

### Table 2. Change in the efficiency of loggers on the accuracy of information², rubles / m³.

| Indicator | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|-----------|------|------|------|------|------|------|------|------|------|------|
| Income | 940  | 1011 | 1104 | 1219 | 1330 | 1470 | 1617 | 1745 | 1794 | 1844 |
| Costs | 913  | 981  | 1067 | 1172 | 1274 | 1400 | 1540 | 1678 | 1715 | 1766 |
| Profit | 27   | 30   | 37   | 47   | 56   | 70   | 77   | 67   | 79   | 78   |
| Efficiency actual, % | 3.0 | 3.1 | 3.5 | 4.0 | 4.4 | 5.0 | 5.0 | 4.0 | 4.6 | 4.4 |
| Efficiency «-15%» | 1.4 | 1.5 | 1.9 | 2.5 | 2.9 | 3.4 | 3.4 | 2.5 | 3.1 | 2.9 |
| Efficiency «+15%» | 4.5 | 4.6 | 5.0 | 5.6 | 6.0 | 6.6 | 6.6 | 5.6 | 6.2 | 6.0 |

²Source - expert assessment for the Leningrad region [10], the authors' calculations.

According to the Accounts Chamber of the Russian Federation, information on forests is different in the constituent entities of the Russian Federation, Rosleskhoz and Rosstat. Effective forest use planning is hampered by the lack of up-to-date information on forest resources. “85% of forest inventory materials are more than 10 years old. This means that there is no reliable information about the state of the forest fund on an area of 974 million hectares”[11].

### Table 3. Change in the economic efficiency of forest management from the accuracy of information², mln. Rubles.

| Indicator | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-----------|------|------|------|------|------|------|------|------|
| Government profit from forest use including harvesting woods | 1310.2 | 1361.0 | 1492.0 | 1566.7 | 1624.5 | 1551.6 | 1601.0 | 1671.6 |
| State expenditures on forest management | 623.5 | 558.4 | 506.4 | 556.1 | 561.9 | 539.4 | 553.8 | 589.5 |
| Result of the state management of forests, % | 602.0 | 789.2 | 841.2 | 951.3 | 1034.4 | 1075.9 | 1141.2 | 1224.3 |
| Result of the state management of forests«-15%» | 117.6 | 72.5 | 77.4 | 64.7 | 57.0 | 44.2 | 40.3 | 36.5 |
| Result of the state management of forests«+15%» | 133.2 | 83.1 | 86.4 | 73.5 | 65.2 | 51.7 | 47.6 | 43.8 |
| Result of the state management of forests«-15%» | 102.1 | 61.8 | 68.3 | 55.9 | 48.9 | 36.7 | 33.0 | 29.3 |

²Source – reporting of the region, calculations of the authors.
Conclusion
The conducted research allows us to draw the following conclusions:

- completeness and reliability of collection and processing of information on the state of forests in the existing organization of forestry, the number of employees, the amount of funding is impossible;
- lack of complete and reliable information about forests leads to false goals of forest policy;
- the lack of complete and reliable information about forests leads to a distortion of the economic efficiency of private business;
- the lack of complete and reliable information about forests leads to a distortion of the economic efficiency of forest management, a shortage of forest income.

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