

THE GLOBAL MARKET OF ROUNDWOOD: FINANCIAL ASPECTS

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Abstract

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The forestry industries cluster plays a key role in ensuring sustainable development and stimulating consumption of renewable resources in various sectors of the world economy. A hypothesis has been put forward and proved for countries that have the largest share of roundwood consumption in relation to its production over the period 2010-2014, according to which a sharp increase in consumption over production is not economically and technologically justified and cannot determine the world trend. The revealed regularities determined the opportunities for the stagnation of the timber industry in the economies of the countries of Lebanon, UAE and Br Virgin Island. In turn, according to the countries of Mauritius, Qatar, Tonga, Uzbekistan, on the contrary, there is a steady increase in consumption of roundwood. In the study of world countries that have the smallest share of consumption in relation to production, a hypothesis has been put forward and proved, according to which the production of roundwood in absolute terms grows at a higher rate than its consumption. In addition, the best indicators of the dynamics of exports of roundwood for the under study period have shown steady growth in the main world countries, except Malaysia. When studying the world experience of state support for the forest sector of the economy, it is necessary to take into account that the main achievements in the forest sectors are provided largely due to the active role of the state, which implies the implementation of the national forest policy. The main priorities should be: consistent decision-making in the field of forest management, taking into account the socio-economic, natural-climatic and ecological features of the territories, as well as the balance of the country's environmental, economic and social interests.

Key words: forestry sector of economy; global competition; roundwood export; natural resources; ecology; innovative forest management

Introduction

In the world space, the most developed common strategy for the sustainable development of the forest sector of the economy belongs to the countries of the European Union. The formed strategy for creating and developing a cluster of forestry industries is based on a single EU development strategy aimed at economic growth and sustainable social and environmental development based on the production of new knowledge and innovative technologies. At the same

time, the derivation of a forestry development strategy is based on the relationship with the forestry sector, including the forest industry, scientific and technical support, transport, services, and forestry.

The strategy of forest management and sustainable development of the forestry sector covers a wide range of issues affecting rural development, environmental protection, trade flows of forest products in domestic and foreign markets, research, industrial and energy policies, and development of cooperation among EU member states. Consequently,

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the interaction between the branches of the forest cluster is the most important condition for accelerating scientific and technological progress and development of the country's innovative activity. Withal, considerable attention is paid to the issues of social sustainability of the forest sector.

Since the adoption of the Forest Strategy in 1998, the existing global agreements on environmental protection, energy, rural development and other sectors that have to some extent affected the social, environmental and economic aspects of the development of the forest cluster have been developed and refined. At the same time, the EU Council has set the task of transforming the EU into a competitive and dynamically developing innovative economy. A key role in achieving these goals is given to science and innovative technologies.

It should be noted that one of the main tasks of European science is the creation of technological, institutional and economic prerequisites for accelerating the innovative development of the EU countries. To solve this problem, several priority areas for the development of science and technology for the period up to 2030 have been determined for all sectors of the national economy, which are integrated into technological platforms, including the forestry sector. Withal, the cluster of forestry industries is meant to play a fundamental role in ensuring the sustainable development of European countries, including the creation of a healthy habitat for people, biodiversity conservation, sustainable agricultural development, and the stimulation of consumption of environmentally friendly products and materials.

Research in the forestry sector of the economy is combined mainly in two technological platforms. The main objective of the technological platform of the forest cluster is to ensure sustainable innovative forest management.

The cluster of forest industries is called upon to play an important role in the development of the technology platform «Germes of the Future». It includes four main directions: ensuring reliable supplies of environmentally friendly food; sustainable rural development; high-quality environment; high competitiveness of goods and wide consumer choice.

Thus, in the long term, until 2030, the cluster of forest industries is called upon to play a key role in ensuring the sustainable development of the major countries of the world. The main aim of states should be creating a competitive, innovative cluster of forest industries and stimulating the consumption of renewable forest resources in various areas of the economy, including energy.

Concept Headings

The transformation of the scientific understanding of forests in works of Russian forest science classics makes

it possible to form the main directions of its development. Thus, N.N. Kolosovsky's (1969) research in "The Theory of Economic Regionalization" noted, that, the most difficult and complex matter in science is the initial positions and concepts. In this case, it is necessary to consider the transformation of scientific accents to understand the problems of the forest. One of the first scientific ideas about the forest emerged precisely as a space, filled with trees.

In the scientific studies of the forest definition, G.F. Morozov (1912) proposed the following interpretation – a set of forest communities consisting of long, wild, non-domesticated plants. It is important that the forest is not only a collection or a simple set of trees, but such a combination of them, in which it is found quite real, and their interaction is tangible. Therefore, the forest creates its own internal environment.

In modern encyclopedic publications, forest is primarily defined as a phenomenon of natural space, which is a natural system consisting of interacting and interrelated components. This system is characterized by dynamic equilibrium, stability, autoregulation, high capacity for recovery and renewal, a special balance of energy and substances, dynamic processes with trends to their stability, geographical conditioning. The understanding of the forest as a natural object flows into the idea of its inseparable connection with the land. In the historical aspect of scientific research, the economic importance of forests has become more complex. The modern perception of the forest in unity with the earth, not only in the biological sense, but also in the legal sense, was formed gradually.

In particular, in the works of the researcher M. Orlov (1983) in determining the forest as a spatial object, it is characterized as a space occupied by tree plants, growing in the community. In this case, the space, or forest area, is covered with forest plants, and the degree of such coverage can be very different. At the same time, G.F. Morozov noted that the forest, being a natural geographical phenomenon, represents a single whole in the dynamics of interaction between forest vegetation and its habitat, mutually changing each other over time. Later, the development of forestry doctrine was added with the idea of the forest biogeocenosis or the forest ecosystem (Sukachjov, 1949). This knowledge served as the basis for the ecosystem management of forests, although in economic practice, which is built on the idea of using the forest, his ideas are still not in demand.

By now, a scientific-practical or natural-economic-legal idea of the forest as a unity of the earth, forest vegetation, fauna and other components of the natural environment, which are of great ecological, social and economic importance, has been developed. Therefore, the modern view of the forest is represented in three directions in the form of:

a) A natural ecological system that is an objectively existing part of the natural environment that has spatial and territorial boundaries and in which living (plants, animals and other organisms) and non-living elements interact as a single functional whole and are interconnected by the exchange of substances and Energy.

b) Natural resources or components of the natural environment, natural objects and natural-anthropogenic objects (created artificially), used or can be used for economic and other activities as sources of energy, products of production and consumer goods, and have a consumer value.

c) Socio-natural environment, which is a set of components of the human environment, natural and anthropogenic objects that have cultural, historical, scientific, educational and other humanitarian and social significance.

Thus, modern forest is represented as a phenomenon of nature, which is also an integrated economic resource and part of our environment.

In the world practice of implementing various long-term programs for servicing and maintaining the forestry sector of the economy, significant attention is paid to issues of socio-economic justification of specific activities. In particular, according to the long-term program for the development of the forestry sector of the US economy, the introduction of innovative technologies in sawmilling and in the production of wood-based panels will significantly block the negative impact of deterioration of wood raw materials. Innovative technologies also provide for the improvement of the quality and useful yield of products, first of all, of various wood raw materials, wood whips, round timber, except for those that are used without processing, as well as crushed wood and waste from logging, intended for processing or that are used as fuel.

Special attention is paid to primary processing of wood raw materials in the form of machining, including cleaning trees from branches, sorting round timber, cutting and grinding.

It should be noted that the world production of forest products after a significant decline in the period 2008-2009 has significantly increased by 2014 in all sectors of the global forest industry. At the same time for fuelwood, the annual growth has amounted to 0.5%. In the countries of the Asia-Pacific region, Latin America and the Caribbean, and also in North America, there was a rapid recovery in wood production. Production growth in Europe, on the other hand, has slowed since 2012 and still cannot recover, especially in Western and Southern Europe, where production and consumption of some wood products, in particular roundwood and sheet wood, showed a decline in production in relation to consumption. In particular, Sweden, Austria, Germany, Finland, Italy, Belgium show a growing lack of own production,

which means that all large volumes of roundwood have to be imported. At the same time, these countries have a fairly large natural resource of natural forest areas (Figure 1).

The review for the period 2010-2014 for the top ten world countries, which have the largest volume of roundwood production in absolute terms, a linear forecast for the short term according to the chosen indicator was formed. According to our estimates, the two countries-producers of roundwood, India and China, will steadily reduce its production. This is characterized by a negative coefficient for the variable x in the linear trend equation, describing the forecast in the form of the equation $y = -382x + 358753$ – for India and $y = -2390x + 352025$ – for China. Another country, Indonesia, also shows a slowdown. The remaining large producers of roundwood are steadily increasing production, these are Brazilia (equation of the form $y = 7205x + 235105$) and Russia with a coefficient of 5823 (the equation of the form $y = 5823x + 173777$) showing the largest growth rate, characterized by a coefficient of 7205.

Materials and Methods

Based on the selected array of statistics from 200 countries, according to the statistics of the Food and Agriculture Organization of the United Nations, the OLS (Ordinary Least Squares) method was used to study and select countries for which the absolute value (cubic meters) exceeds its production of round timber for the period 2010-2014 (Table 1).

The conducted researches of the received data for the period 2010-2014 are characterized by a sharp increase in the consumption of roundwood over its production in Mauritius, which indicates the revival of economic processes in this country, and those results in an increase of timber production. However, the standard deviation of the consumption / production ratio showed the instability of the economies of individual countries in the field of natural materials: the lowest value was 0.7 (UAE) and that characterizes stability of the forestry production area and the largest value of 3.43 (Mauritius) indicates an unstable increase in consumption over production ratio in that country. It should be noted that when calculating the production index, the data on the production of goods that can be consumed immediately in the production of other goods (for example, wood pulp, which can be immediately used for paper production as part of a continuous process) is taken into account. The size of consumption by country takes into account the actual size of production and difference between exports and imports of roundwood (Figure 2).

The study of the statistical data of seven world countries that have the largest share of consumption in relation

Table 1
Share of the consumption ratio over roundwood production by world countries with the greatest result

Countries	Consumption/production ratio					Average	Standard deviation
	2010	2011	2012	2013	2014		
Uzbekistan	10.00	10.63	8.83	9.56	10.72	9.95	0.78
Mauritius	2.93	2.36	3.43	3.50	10.67	4.58	3.43
UAE	10.11	9.06	8.83	9.72	8.37	9.22	0.7
Br Virgin Island	4.00	4.00	5.00	12.00	6.00	6.20	3.35
Qatar	1.80	0.80	4.40	3.00	5.00	3.00	1.75
Lebanon	3.92	3.85	4.54	1.50	3.62	3.48	1.16
Tonga	4.75	3.25	3.75	2.75	3.50	3.60	0.74

to production made it possible to formulate the hypothesis 1. A general trend that characterizes the share of consumption in relation to roundwood production in countries with the best indicators in absolute terms has not been revealed, since 4 out of 7 countries show Growth, and 4 out of 7 countries – Fall. Thus, it has been proved, that a sharp increase in consumption over production ratio is not justified economically and technologically, and does not determine the overall world trend (Figure 2). This statement can be proved by a negative coefficient value of -0.3 (Lebanon and UAE) and -0.4 for Br. Virgin Islands, which characterizes the decline in consumption of roundwood production, and hence, the demand. The revealed tendency can contribute to the stagnation of the timber industry in these economies. The values of the coefficient of determination $R^2 \ll 1$ for selected countries also confirm the weak influence of the qualitative characteristics of the selected values. In particular, for Mauritius, Qatar, Tonga, the coefficient of determination R^2 is comparable to 1 (takes the values 0.9; 0.6; 0.7), which characterizes the obtained trend equations as the most probable. In Lebanon, United Arab Emirates, Br. Virgin Islands, the consumption of roundwood is predicted to decrease in comparison with their production in the short-term period,

and in Mauritius, Qatar, Tonga, Uzbekistan, on the contrary, is predicted to grow steadily.

In turn, the study of the smallest parity in the share of production / consumption of roundwood on the basis of the selected array of statistical data of 200 states, using the OLS method, has made it possible to select ten countries, for which the selected absolute values (cubic meters) has been the lowest for the period 2010-2014 (Table 2).

The main indicator of the sustainability of economic processes in the timber industry is the value of the Standard deviation reflecting the spread of data around the average. This has been shown by the analysis of countries, that have the lowest level of consumption of roundwood in relation to its production. Slovenia showed the largest value of this indicator – 0.08, that reflects instability of roundwood consumption in this country, and has a negative impact in this area of the economy. The smallest value of the index of 0.01 is Solomon Island that indicates the stability of the ratio in the consumption / production pair and allows confirming positive dynamics in the economy of this country.

Thus, the study of statistical data on countries with the lowest share of consumption in relation to production has made it possible to formulate hypothesis 2. Roundwood

Table 2
The lowest rate of the ratio of the share of consumption over the production of roundwood around the world

Countries	Consumption/production ratio					Average	Standard deviation
	2010	2011	2012	2013	2014		
Netherlands	0.75	0.92	0.79	0.75	0.77	0.79	0.07
Suriname	0.83	0.78	0.77	0.79	0.73	0.78	0.04
Slovakia	0.80	0.78	0.80	0.70	0.73	0.76	0.05
Ukraine	0.77	0.76	0.76	0.73	0.72	0.75	0.03
Estonia	0.71	0.66	0.69	0.66	0.68	0.68	0.02
Papua New Guinea	0.72	0.66	0.66	0.65	0.62	0.66	0.04
Slovenia	0.82	0.79	0.74	0.71	0.62	0.74	0.08
Eq Guinea	0.70	0.58	0.57	0.58	0.49	0.58	0.07
New Zealand	0.56	0.52	0.49	0.44	0.45	0.49	0.05
Solomon Island	0.09	0.07	0.07	0.07	0.07	0.08	0.01

production in absolute terms is growing at a higher rate than its consumption in countries with the lowest ratio in absolute terms in the consumption / production.

This statement can be characterized by negative coefficient values for the variable x in the trend equation for the ten analyzed countries (Figure 3). The coefficient amounted to values in the range from -0.0475 to -0.004. In turn, the determination coefficient, reflecting the level of approximation of the trend equation to the actual data, is rather high in the studied countries, and is close to 1 (varies from 0.75 to 0.94). Thus, it is possible to predict with a high degree of probability a further reduction in the consumption of roundwood in relation to its production in absolute values (cubic meters), in these countries.

The selection of an array of statistical data from 200 states using the OLS method allowed to conduct a study and select countries where the absolute value (cubic meters) is the largest value for roundwood exports for the period of 2010-2014. (Figure 4).

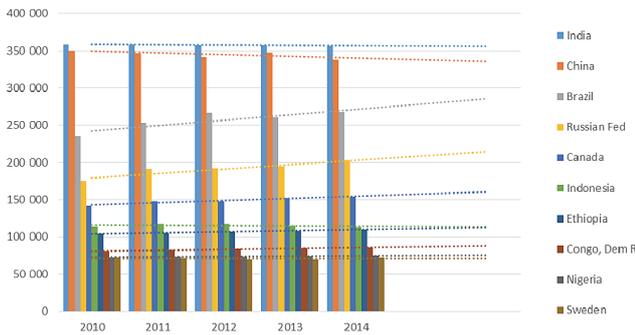


Fig. 1. The countries having the greatest on the output of round wood in absolute value, cubic meters
Calculations of authors made by data www.fao.org/catalog/gi-phome.htm

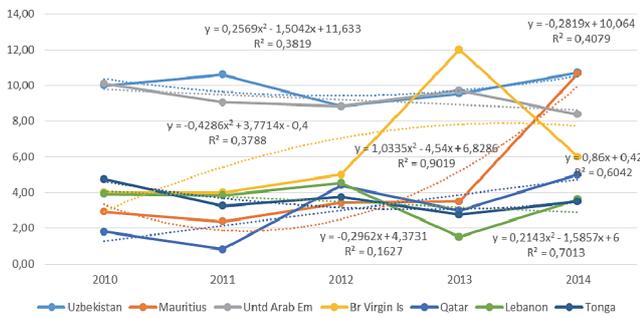


Fig. 2. Time series of the dynamics of shares of roundwood around the world

The conducted studies revealed the best indicators of the dynamics of exports for the period of 2010-2014. In New Zealand, a linear equation of the form $y = 246523x + 727937$ and the value of the determination coefficient, confirms the

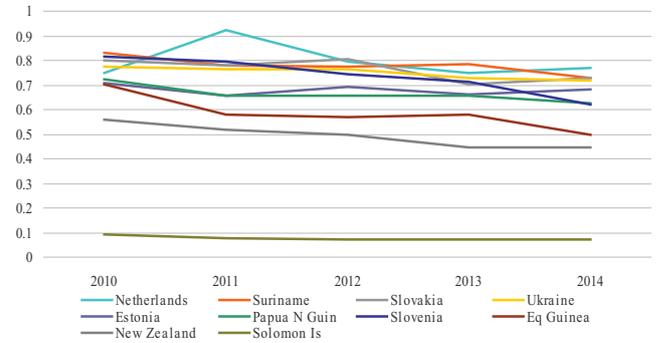


Fig. 3. Time series for the dynamics of roundwood shares around the world

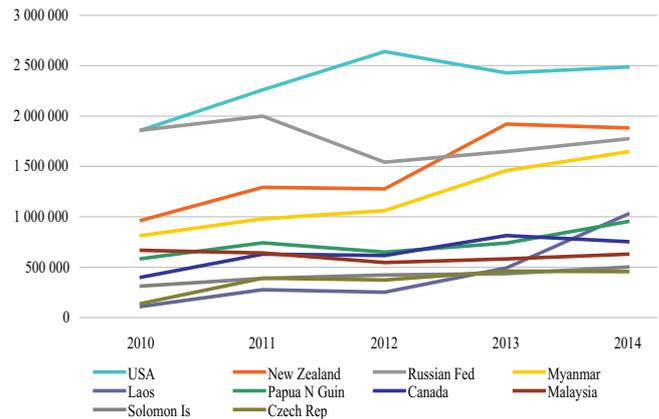


Fig. 4. Time series for the dynamics of roundwood exports

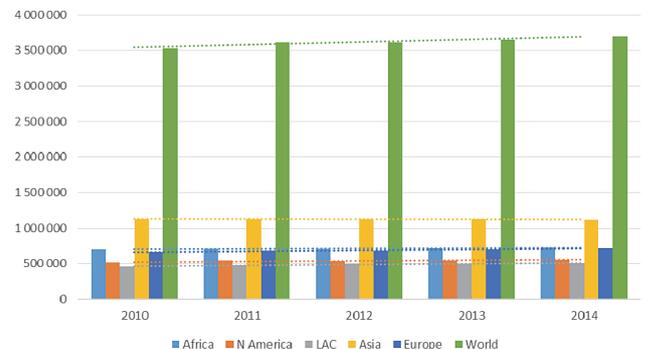


Fig. 5. Continents with the level of production of roundwood, cubic meters

Table 3
Matrix of correlation coefficients of roundwood export in absolute values

	USA	New Zealand	Russia	Laos	Papua New Guinea	Canada	Malasia	Solomon island	Czech Republic
USA	1								
New Zealand	0.849597	1							
Russia	-0.64905	-0.2507	1						
Laos	0.552712	0.859112	0.236455	1					
Papua New Guinea	0.470439	0.777959	0.188743	0.931633	1				
Canada	0.808289	0.969023	-0.30158	0.81718	0.82553	1			
Malasia	-0.67309	-0.64551	0.700601	-0.28252	-0.42305	-0.77586	1		
Solomon island	0.810409	0.924018	-0.34828	0.78463	0.844268	0.98256	-0.7988	1	
Czech Republic	0.787538	0.931826	-0.30432	0.806738	0.861503	0.988451	-0.78646	0.998235	1

significant influence of the quality characteristics of the selected values. In turn, the indicators of Malaysia determine the tendency to decrease the export volume, that is confirmed by the equation $y = -13601x + 654202$ and the negative slope coefficient of the straight line. All other countries demonstrate a steady growth of indicators, which demonstrates different values of the rate for different countries.

In order to determine the feasibility of roundwood exporting by individual countries, it is necessary to analyze the two interrelated characteristics "physical volume" and "cost".

As a result of constructing the matrix of correlation coefficients for absolute values for world roundwood export, the following data was obtained (Table 3).

The correlation coefficient values indicate a strong dependence of exports between the USA and New Zealand, New Zealand and Laos, New Zealand and Papua New Guinea, Canada and USA, etc., which is characterized by close to 1 correlation coefficients (0.849597497, 0, 859111526,

0.7779959368, 0.808289229, etc.). At the same time, the fall in the value of exports in one of the countries in a pair will affect the decrease in the volume of exports to another. The roundwood exports of Malaysia and Canada are characterized by a negative correlation coefficient of -0.775858843, indicating a strong and oppositely directed relationship between these countries, therefore, a drop in export performance in one country, possibly leading to growth in another.

As a result of constructing the matrix of correlation coefficients for countries, exporting roundwood, in terms of money value (US dollar), the following data was obtained (Table 4).

The obtained correlation coefficient studies show a strong dependence of the indicators between Russia and Malaysia (the coefficient value of 0.870243561), Laos and Papua New Guinea (coefficient 0.961004341), Czech Republic and Canada (coefficient 0.96318307), Solomon Islands and Canada (0.86756286) and a number of other pairs of countries, the

Table 4
Matrix of coefficients of correlation of roundwood export in US dollars

	USA	New Zealand	Russia	Laos	Papua New Guinea	Canada	Malasia	Solomon island	Czech Republic
USA	1								
New Zealand	0.601247	1							
Russia	-0.65438	-0.31812	1						
Laos	0.478359	0.828006	-0.10838	1					
Papua New Guinea	0.474876	0.786429	0.081691	0.961004	1				
Canada	0.739593	0.951934	-0.33941	0.702432	0.716505	1			
Malasia	-0.84469	-0.34017	0.870244	-0.03375	0.031837	-0.50297	1		
Solomon island	0.829344	0.866637	-0.39143	0.883916	0.867338	0.867563	-0.46468	1	
Czech Republic	0.83239	0.859555	-0.28919	0.672872	0.736081	0.963183	-0.54168	0.894046	1

correlation coefficient of which is close to 1. The positive sign of the calculated correlation coefficient indicates the unidirectional growth or fall in the value of exports of these countries. And negative values (-0.844691551 for Malaysia and USA) mean that the connection is strong, but of different directions, i.e. the drop in exports in one of these countries will mean an increase in exports in another country. The correlation coefficient comparable to 0, characterizes the weakly expressed dependence of the parameters studied. For example, between Czech Republic and Russia (coefficient -0.289187126) between Laos and Malaysia (-0.033751096).

Results and Discussion

The problem of growing forests' duration is put forward by the main principle of forestry – the continuous and sustainable use of the forest, which is aimed at matching the scale of forest use with the rates and scales of forest reproduction. At the same time, the complex of methods that serve to ensure the continuous use of the forest includes types of activities for the creation of an economically expedient structure, appropriate to their designated purpose. These include land preparation, planting, creation of the necessary infrastructure to ensure economic accessibility of forests (road network), fire protection and protection against pests and diseases, long-term lease, creation of nurseries, seed farming and drainage reclamation.

The specific features of the forestry are: intertwining of economic and natural reproduction process, spatial dispersal of the production, the self-restoring ability of the forest, the short productive (working) period in the general cycle of reproduction. Another problem is the secondary forests' order of productivity. Long periods of forest growing, which go beyond the temporary limits of lease relations, shift the burden of investment in forestry on the shoulders of its owner.

Thus, among the basic principles of forest policy, it is necessary to include those that provide the basis for the emergence of various forest management systems:

a) Sound and consistent decision-making in forest management.

b) Accounting for socio-economic, natural-climatic and ecological features of the territories.

c) Compliance with the balance of the country's environmental, economic and social interests.

The conducted empirical studies of a sample of 200 countries and specifically chosen 10 countries with the largest volume of roundwood production in 2014 in absolute terms (cubic meters), allowed to formulate the following statement. The principle of the ratio of consumption to production is related to the general trend characteristic of the entire world economy (Figure 5).

At the same time, when studying the world experience of state support for the forest sector of the economy, it is necessary to take into consideration that the main achievements in the forest sectors are provided largely due to the active role of the state, which carries out the national forest policy. Most favorable conditions for forest management on a sustainable basis are created by the efforts of the state. A significant example of reasonable acting state is Canada, where most forests are state-owned. At the same time, it is necessary to take into account the negative aspects of application the lease form of forest management, due to the lack of competition incentive for the renter, low degree of interest in the multi-purposeful use of forests and the lack of long-term investments motivation. It is necessary to take into account the positive experience of applying the contract organization of forest management (as in the United States), which ensures competition, quality of work, consideration of environmental requirements and integration in the activities of forestry enterprises, considering Germany experience.

Thus, the order of forest potential reproduction has to be related with the creation of environmentally sustainable, productive complex forestry systems.

The implementation of the forest potential is related to deep processing of raw materials and deliberate industrial policy, like it has been done in Finland, while creating a forest cluster. In this case, the sustainable development of forest potential is possible only when the interests of all the three sides – the state, business and the society, are taken into account.

Based on the selected array of statistical data of 200 states, the OLS method was used to study and select countries with the largest and lowest levels of roundwood production and consumption. For countries with the highest level of production, it is determined that the absolute value (cubic meters) of roundwood does not depend on the area of forest areas in geographic coverage in 2014 (Figure 6).

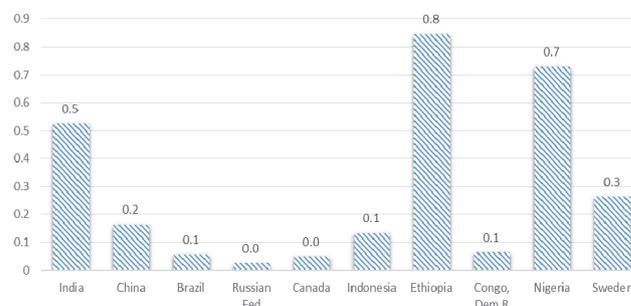


Fig. 6. Countries with the largest share in the production of roundwood in comparison to the forest area by geographic coverage in 2014

A strategic forest policy should form the conceptual basis for the development of national and sub-national programs with the purpose of sustainable forest management in any country. These include planning, implementation and monitoring of the forestry, formation of comprehensive activities. At the same time, a strategy for the sustainable development of the forest sector in the sphere of roundwood makes it possible to increase competitiveness in the world market.

The analysis conducted by Birger S., Alexander M., A. Maarit I. Kallioc, Anne T. shows that large tariffs, which Russia has set up on its roundwood exports, decrease harvest and roundwood prices in Russia, but they improve the speed of development in the Russian sawnwood and pulp industry (Birger, 2010). The results also suggest that policies, which improve the investment climate in Russia, are more vital than the tariffs for Russian forest industry to develop favourably. Among the tariff settings considered, the prevailing one of 15€ per cubic meter with non-coniferous pulpwood exempted, seems most beneficial for Russia. With a tax of 50€ per cubic meter, its forest industry would not develop much stronger than in the 15€ case, but forestry would suffer from a drastic harvest decrease caused by a nearly complete stop in the Russian roundwood exports, and negligible tax income would be generated.

In turn, the main tasks can be: imitative, reconstructive and stimulating. In particular, these include:

- forest legislation improvement;
- forest supervision and monitoring;
- modernization of forest management;
- improvement of the system of payments for the use of forests;
- the system for preventing, detecting and extinguishing forest fires;
- technical re-equipment of forest fire organizations;
- improvement of the forest protection system;
- modernization of forest science and education;
- development of the vocational education system, etc.

The solution of these problems requires additional financing from the budget.

Among the reconstructive tasks, we can name the adoption of norms, ensuring the right of state bodies to implement protect and reproduction measures. It is necessary to introduce norms that ensure long-term contracts for the performance of works related to the protection and reproduction of forests.

The tasks aimed at stimulating, first of all, are aimed at taking into account regional peculiarities in the form of granting forests for use, developing new forestry and environmental standards, with the consideration of forest areas specifics, determining the level of development of transport

infrastructure, state partnership and stimulation of forest business. The use of roundwood products for construction purposes, furniture plants, biofuel enterprises, pulp and paper products on the domestic market, should be supported, and public purchases of these products should be stimulated, so as the production of high-quality environmental products, aiming at developing a «green» economy.

In turn, the studies, conducted by the European Organization of the Sawmill Industry aisle (Kimmo, 2014) confirm, that direct loss of export revenues of log exports in China amounted to € 332 million. In addition to the potential direct loss of export revenues of log exports the losses of other wooden products can potentially mount up to as high as 20 000 job opportunities, € 2,1 billion sales revenues, € 0,5 billion value added. These estimates do not take into account the possible compensation request by China for the loss of its own forest resources.

The voluntary forest certification institute should be considered as a modern factor in the development of the sustainable forest management.

One of the most recognized, widespread and authoritative certification systems is the FSC (Forest Stewardship Council) system. Forest certification reflects triple control, carried out by the state, certification body and the public. The FSC certificate is a sign of quality of forest products in 80 countries. In particular, 37.36 million hectares of forests are certified in accordance with international standards. In this case, half of the exported roundwood comes from certified forests or is controlled in accordance with the requirements of the FSC standard. Forest management certification also relates to logging enterprises. Bringing their activities in line with the requirements of the FSC is a long and time-consuming work, on which large holdings are being hesitant, and their position is pushed by the need in positioning of their products on external (especially environmentally sensitive) markets.

One of the examples of such alignment with the requirements of the certification is debarking of logs – a well-proven and easy measure to prevent the spreading out of majority of plant diseases. By removing the bark the majority of microorganism and their substrate is removed thus, debarking enhances the effectiveness of the chemical treatment and hence reduces the need for use of hazardous chemicals. Furthermore, debarking enables a more accurate visual inspection of the shipped material prior to shipping. As the legal responsibility of the plant disease control and prevention lies in the hands of the exporting country it goes without saying that EU and its member countries should immediately enforce its export certification system and establish proper administrative measures.

The conducted analysis shows that it is crucially important to consider international experience in dealing with the financial aspects of the roundwood market. When considering the specifics of the application of world experience, it is necessary to single out both individual countries and groups of regions, taking into account the following criteria:

a) economic – international specialization of the country in the forestry and woodworking industry: Canada, Finland, Sweden;

b) geostrategic (geopolitical, geo-economics) – the experience of the EU deserves attention in this respect;

c) socio-ideological – attitude towards the forest in the society and use of intensive forest management and forestry models in practice: Finland, Germany;

d) Institutional – developing forest relations, forest policy in the context of economic security: USA, Canada.

References

- Akay, A.E., 2009. Computer-Aided Forest Road Design. Minimizing Total Costs of Construction, Maintenance, and Transportation. *Verlang Dr. Müller*: 156. ISBN: 978-3-639-15464.
- Birger, S., A. Moiseyev, A. Maarit, I. Kallio and A. Toppinen, 2010. Forest sector market impacts of changed roundwood export tariffs and investment climate in Russia. *Forest Policy and Economics*, 12 (1): 17-23. Doi 10.1016/j.forpol.2009.09.016.
- CEC, 1998. Communication from the Commission to the Council and the European Parliament on a forestry strategy for the European Union. Brussels: European Commission, COM. 1998, 649, 03/11/1998:25.
- CEC, 2006. Mitteilung der Kommission an den Rat und das europäische Parlament über einen EU-Forstaktionsplan. Brussels: *European Commission*, COM. 2006, 302 endgültig: 15.
- CEC, 2013. A new EU forest strategy: for forests and the forest-based sector, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels: *European Commission*, COM. 2013, 659 final:17.
- European organization of the sawmill industry AISBL, 2014. Safeguarding the EU exports of wood and wooden products. <http://www.eos-oes.eu/>
- Global Forest Resources Assessment, 2015, Desk reference. Food and Agriculture Organization of the United Nations Rome: 253.
- Gollany, H.T., R.W. Rickman, Y. Liang, S.L. Albrecht, S. Machado and S. Kang, 2011. Predicting agricultural management influence on long-term soil organic carbon dynamics: Implications for biofuel production. *Agronomy J*, 103: 234-246. DOI: 10.2134/agronj2010.0203s.
- Kolosovskiy, N.N., 1969. The theory of economic regions. *Mysl'*, 673 (Ru).
- Kosov, M.E., R.G. Akhmadeev, O.A. Bykanova, V.S. Osipov, K.V. Ekimova and S.V. Frumina, 2016. Economic practicability substantiation of financial instrument choice. *Journal of Applied Economic Sciences*, 11 (8): 1613-1623.
- Kramer, R.A. and D.E. Mercer, 1997. Valuing a global environmental good: U.S. residents' willingness to pay to protect tropical rain forests. *Land Economics*. 73 (2): 196-210.
- Morozov, G.F., 1912. Doctrine of the forest. *SPb.*: 83 (Ru).
- Olson, S., R. Gangnon, G. Silveira and J. Patz, 2010. Deforestation and malaria in Mancio Lima County, Brazil. *Emerg. Infect. Dis.*, 16 (7):1108-1115.
- Orlov, M.M., 1983. Forests are water-protective, protective and forest parks. Organization and management of the economy. *Lesn. Promyshlennost'*, 68 (Ru).
- Proposal for a Regulation establishing Horizon, 2020. The Framework Programme for Research and Innovation (2014-2020). COM (2011): 809.
- Rejmers, N.F., 1990. Natural resources: dictionary — directory. *Mysl'*: 264 (Ru).
- Renewables, 2015. Global status report. Annual Reporting on Renewables: Ten years of excellence. Paris, *REN21 Secretariat*: 250.
- Rifkin, J., 2011. The Third Industrial Revolution: how Lateral Power is Transforming Energy, the Economy and the World. N.Y.: *Palgrave Macmillan*.
- Rifkin, J., 2005. The European Dream: How Europe's Vision of the Future Is Quietly Eclipsing the American Dream, *New York*: 434 ISBN 9780745634258
- San-Miguel-Ayanz, J., J.M. Moreno and A. Camia, 2013. Analysis of large fires in European Mediterranean landscapes: Lessons learned and perspectives. *Forest Ecology and Management*, 294: 11-22. doi:10.1016/j.foreco.2012.10.050.
- Saura, S., C. Esteguil, C. Mouton and M. Rodriguez-Freire, 2011. Ecological Indicators – Network analysis to assess landscape connectivity trends: Application to European forests (1990–2000). *Ecological Indicators*, 11(2): 407-416. doi: 10.1016/j.ecolind.2010.06.011.
- Schulz, T., F. Krumm, W. Bucking, G. Frank, D. Kraus, M. Lier, M. Lovric, M. Vander and Y. Paillet, 2014. Comparison of integrative nature conservation in forest policy in Europe: a qualitative pilot study of institutional determinants. *Biodiversity & Conservation. Special Issue "Perspectives on Forest Conservation"*, 23 (14): 3425-3450. Doi: 10.1007/s10531-014-0817-0.
- Sosa Cedillo, V., 2002. Impacto en el sector forestal de políticas externas – Estudio de caso de México con especial referencia al estado de Chihuahua. Report prepared for the FAO Forestry Department, Policy and Planning Division, Policy and Institutions Branch. Rome.
- Sukachjov, V.N., 1949. On the relationship between the concepts of "geographical landscape" and "biogeocenosis". Questions of geography. *Geografiz*, 16: 45-60 (Ru).

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