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Organization and Financing of Forestry Research in Ukraine

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About the Project “German-Ukrainian Agricultural Policy Dialogue” (APD)

The project German-Ukrainian Agricultural Policy Dialogue (APD) started 2006 and is supported up to 2018 by the Federal Ministry of Food and Agriculture of Germany (BMEL). On behalf of BMEL, it is carried out by the mandatary, GFA Consulting Group GmbH, and a working group consisting of IAK AGRAR CONSULTING GmbH (IAK), Leibniz Institute of Agricultural Development in Transition Economies (IAMO) and AFC Consultants International GmbH. Project executing organization is the Institute of Economic Research and Policy Consulting in Kyiv. The APD cooperates with the German land use and management society (BVVG) on the implementation of key components related to the development of an effective and transparent land administration system in Ukraine. Beneficiary of the project is the Ministry of Agrarian Policy and Food of Ukraine.

In accordance with the principles of market economy and public regulation, taking into account the potentials, arising from the EU-Ukraine Association Agreement, the project aims at supporting Ukraine in the development of sustainable agriculture, efficient processing industries and enhancing its competitiveness on the world market. With regard to the above purpose, mainly German, but also East German and international, especially EU experience are provided by APD when designing the agricultural and forest policy framework and establishing of relevant institutions in the agriculture sector of Ukraine.



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1 Structure, Organisation and Coordination of Forestry Research (State, Universities, Business)

1.1 Research Institutes

Forest research is carried out by two principal scientific institutions, Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky (hereinafter URIFFM) and Ukrainian Mountain Forestry Research Institute named after P. S. Pasternak (hereinafter UMFRI).

URIFFM and UMFRI are the legal entities that independently solve research, education, economic and financial issues and planning current and future and forecasting of activities.

In 2004 by the joint decision of the National Academy of Science and the State Forest Resources Agency of Ukraine (hereinafter SFRA), URIFFM and UMFRI got the status of dual subordination to the National Academy of Science (in research and methodology) and to the SFRA (in financial and economic activities and in research and methodology).

The SFRA defines the list of enterprises, institutions, and organizations that are part of the research network.

Research network of URIFFM and UMFRI covers all natural zones and unique forest research objects, some of which were created over 150 years ago. Nowadays the network is well-balanced according to the Ukrainian natural and economic zones. Therefore it is enabled to provide the high-level research.

All scientific and research institutions and state enterprises are legal entities that have their own statutes, independent balance, accounts in the authorities of the State Treasury of Ukraine and banks, common seals with the unique name, and other seals and stamps for management purposes.

The relationship between URIFFM and UMFRI and their subordinate research institutions and state enterprises is based on relevant programs and plans of scientific and economic activity that are approved and approved by the institutions.

Research institutions and state enterprises of the research network inform institutes about scientific and economic activity within the established timeframe using the prescribed forms. The institutes coordinate the scientific and economic activity of the subordinate research bodies and state enterprises of the research network in accordance with the current legislation.

The present structure of scientific institutions, affiliates, and enterprises of the research network of the SFRA allows to carry out scientific studies in various areas on a single methodical basis, taking into account regional problems of forestry management.

The research institutes are responsible for the high-skilled professionals training through postgraduate and doctoral programs. The PhD training programs cover the following specialties: forest plantations and phytomelioration; forest science and forestry.

1.1.1 Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky

URIFFM (Kharkiv) is a public research institute of national importance, which conducts basic and applied research on forests and forest landscapes, forest ecosystems, forest ecology and forest radioecology, reforestation and afforestation, forest protection, forest breeding, new information technologies in forestry, inventory of forests and forest management, hunting, and other uses of the resources forests provide. The sphere of scientific influence of the institute extends to the forest ecosystems of the flat part of Ukraine.

Research Program of URIFFM

The Institute's research program is organized into ten departments:

- Department of Forestry
- Department of Forest Ecology
- Department of Silviculture and Forest Melioration
- Department of Forest Protection
- Department of Increase of Forest Resistance
- Department of Forest Monitoring and Certification
- Department of Forest Breeding
- Department of Economics
- Department of New Information Technologies in Forestry
- Department of Forest Soils

URIFFM research network

URIFFM and its research network are established to provide conditions for high-quality scientific research in all natural zones of Ukraine. The research network of URIFFM includes the following research institutions and state-owned enterprises:

- Polissya branch of URIFFM (Zhytomyr region)
- State Enterprise "Steppe Branch of URIFFM named after V. M. Vinogradov" (Kher-son region)
- State Enterprise "Kharkiv Forest Research Station" (Kharkiv region)
- State Enterprise "Kyiv Forest Research Station" (Kyiv region)
- State Enterprise "Vinnitsa Forest Research Station" (Vinnitsa region)
- State Enterprise "Novgorod-Siverska Forest Research Station" (Chernihiv region)
- State Enterprise "Mariupol Forest Research Station", (Donetsk region)
- State Enterprise "Luhansk Agroforestry Research Station", (Luhansk region)
- State enterprise "Crimean Mountain-Forest Research Station" (Crimean Mountain, Alushta)
- Kranotrostanets subbranch of URIFFM (Sumy region)

State Enterprise "Luhansk Agroforestry Research Station" suffered material losses as a result of Anti-Terror Operation in Donbas and temporary occupation of some eastern regions of Ukraine. The administration of the station was forced to change the actual address, having moved from Lugansk city to Starobilsk district of the Luhansk region. The

offices, equipment, vehicles, and monitoring and communications system of the station had been severely damaged.

As a result of the temporary occupation of The Crimean Peninsula, where the State enterprise "Crimean Mountain-Forest Research Station" is located, URIFFM has lost contact with collaborators in all fields of scientific activity; in addition, a number of valuable scientific objects have been lost, where long-term stationary field research was carried out.

1.1.2 Ukrainian Mountain Forestry Research Institute named after P. S. Pasternak

UMFRI (Ivano-Frankivsk) is a research center in mountain forest management. The sphere of scientific influence of the institute extends to the forest ecosystems of Ivano-Frankivsk, Transcarpathian, Lviv and Chernivtsi regions, where numerous scientific and production objects are established.

Research program of UMFRI

- Department of Forestry and Forestry
- Department of Forest Preserving Technologies and Transport
- Department for Reforestation and Breeding
- Department of Ecology and Forest Protection

UMFRI research network

- Transcarpathian subbranch (Mukacheve)
- Mountain Forestry Research unit (Ivano-Frankivsk region)

1.1.3 Number of scientific workers

As of 01.03.2018, the number of employees working in science in URIFFM and UMFRI amounts to 225 persons. The number of Ph.D. and Dr. habil. in the network is 57 persons. By the age, almost half of all workers are under 50 years. The number of young scientists (under the age of 35) is only 11 %.

The number of Ph.D. students was 3 at the end of 2017. From 2010 to 2017, 40 Ph.D. students were trained within the SFRA. Sixty-eight percent of them are currently employed in the URIFFM and its research network. Because of a decrease in funding, the number of students accepted for post-doctoral training dropped by two thirds from 2014. Seventy percent of Ph.D. students have the basic education in the field of "Forestry" and "Landscape-gardening".

Some of the main problems of training highly skilled personnel is the low level of material support as well as the lack of a mechanism for improving housing conditions for rural youth.

1.2 Educational institutions

Ministry of Education and Science of Ukraine coordinates scientific activity in higher educational institutions.

The need for mid-level professionals for forest enterprises in Ukraine is provided by 17 higher educational institutions of the 1st-2nd levels of accreditation, such as: Bereznivsky

Forest College (Rivne region), Velykoanadolsky Forest College (Donetsk region), Kremetsky Forestry Engineering College (Ternopil region), Lubensky Forestry Engineering college (Poltava region), Malynsky Forestry Engineering College (Zhytomyr region), Storozhinetsky Forest College (Chernivtsi region), Chuhuevo-Babchansky Forest College (Kharkiv region), Shatsky Forest College named after V. V. Sulko (Volyn region) and others.

Educational institutions train specialists in the education and qualification level "junior specialist" in the following specialties: "Forestry", "Hunting economy", "Green building and gardening", "Forest harvesting and primary wood processing", "Exploitation and repair of forest equipment", "Wood processing", "Land management", and "Accounting".

There are 26 higher education institutions of the 3rd-4th levels of accreditation in Ukraine, which train specialists with basic and complete higher education in the education and qualification levels "bachelor", "specialist" and "master" in the specialties 205 - "Forestry" and 206 - "Landscape management", among which: National University of Life and Environmental Sciences of Ukraine (Kyiv), Ukrainian National Forestry University (Lviv), Kharkiv National Agrarian University named by V. V. Dokuchaev (Kharkiv), Zhytomyr National Agroecological University (Zhytomyr), O.M. Beketov National University of Urban Economy in Kharkiv (Kharkiv).

The structure of higher education institutions of the 3rd-4th levels of accreditation, which train specialists in the education and qualification levels "bachelor", "specialist" and "master" in the specialties 205 - "Forestry" and 206 - "Landscape management", must be optimized taking into account regional staffing needs of forest enterprises.

2 Organization and Coordination of Research in Forestry

2.1 Scientific institutions and research network of the State Forest Resources Agency of Ukraine

The general requirements, procedures and rules for selection and approval of research topics, the ongoing monitoring of the studies, evaluation of the results obtained, their acceptance and implementation are defined in the Regulations on the procedure for research area development and monitoring of the research implementation by scientific institutions subordinated to the SFRA (hereinafter Regulations). The Regulations are developed in accordance with the Law of Ukraine "On scientific and technical activity", the Regulations on the SFRA, and current legislative and normative acts regulating relations in Science and Technology.

Preparation of the draft long-term research plan of the SFRA, which will be financed by the State Budget of Ukraine, is carried out in the following order:

- In the second quarter of the year preceding the planning period (before the start of forming a budget request for the next year), the structural unit of the State Forest Resources Agency on Science and Technology sends to the interested organizations, enterprises, and institutions a request for the proposals on the areas of forward scientific research in the forestry.
- The structural unit on Science and Technology specifies the priority areas of scientific research and provides an indicative list of topics of scientific research of the

SFRA for the planned period on the basis of the proposals of the structural subdivisions of the SFRA, subordinate institutions and enterprises, the National Academy of Sciences of Ukraine, subordinate research institutions, other forest scientific institutions, and non-governmental and public organizations.

- The indicative list of research topics of the SFRA is the basis for the formation, through a competitive process, of the Thematic Plan of scientific research of the SFRA on a planned period.

For the competitive selection of proposals and determination of implementing agents among the subordinate research institutions, an expert commission is established, and its composition is approved by the order of the SFRA. The expert commission includes the Deputy Heads of the SFRA, the head of the structural unit of the State Forest Resources Agency on Science and Technology and individual specialists of the unit, heads of structural units of the SFRA responsible for the topics of scientific research.

The expert commission carries out competitive selection of scientific research topics included in the indicative list of research topics of the SFRA, taking into account their compliance to:

- Priorities of scientific research and works of the SFRA;
- Tasks addressed to the SFRA by Verkhovna Rada of Ukraine, the President of Ukraine, and the Cabinet of Ministers of Ukraine;
- Tasks specified by the Regulations on the SFRA.

In addition, consideration is given to:

- The consistency of the proposals with the real needs of forestry and hunting and society development;
- The orientation of the proposals for obtaining new results;
- The growth of the real economic returns from the investments of budget funds, labor and material resources in the science;
- The linkage of the proposal implementation results and the needs of forestry and hunting and other sectors of the economy, as well as the needs of domestic forest enterprises.

Based on the decisions of the expert commission, the structural unit of the State Forest Resources Agency on Science and Technology forms the perspective "Thematic Plan of Scientific Research of the State Forest Resources Agency of Ukraine". The Thematic Plan is the main form of scientific research planning in the Agency. The Plan is approved by the order of the SFRA.

The Thematic Plan of the SFRA is the basis for the preparation of budget proposals for the financing of scientific research at the expense of funds allocated to the SFRA from the general fund of the State budget to finance the activities of subordinate research institutions.

The Thematic Plan shall be updated annually, taking into account the scientific studies completed in the previous year and new tasks approved for the current and subsequent years.

Changes to the Thematic Plan are approved by the order of the SFRA. In case of approval of plan revisions, the relevant changes and additions shall be entered into scientific research contracts.

The SFRA annually, if necessary, specifies the Plan and the stages and amounts of funding for individual topics, after obtaining information on the maximum amount of funding for scientific research for the next year. Updated Thematic Plan is approved by the order of the SFRA.

By funds allocated to the SFRA from the general fund of the State Budget to finance the activities of subordinate research institutions, the priority is given to financing:

- The development of drafting legislative acts of Ukraine and regulatory documents for the SFRA;
- R&D, aimed at solving the priority problems of forestry and hunting, implementing government regulations arising from laws and legislative acts of Ukraine, including State Programs, Regulations on the SFRA and the sector's Long-Term Research Programs.

The structural unit of the State Forest Resources Agency on Science and Technology monitors the conducting of scientific research and compliance with the terms of a contract. It is necessary for a timely decision on the fund use efficiency and revisions, if necessary, on funding amount, implementing agents, termination of works under the contract, etc.

The Contractor provides information on the work progress in phases in the form of reports (intermediate, final) or other forms of scientific and technical products, together with the acts of acceptance of the research results in terms and in the form provided by the Contract.

The structural unit of the State Forest Resources Agency on Science and Technology provides a certificate on the activities of the subordinate research institutions and the progress of the R&D implementation for the consideration of the State Forest Resources Agency's Board.

The SFRA annually submits information on the main results of R&D activities, conducted by subordinate scientific institutions at the expense of the state budget funds, to the Ministry of Education and Science of Ukraine.

Depending on the nature of the work, the final result of the research can be draft laws and government decisions, scientific and technical reports, methodologies, recommendations, instructions, specifications for conducting research, technical standards documentation, conclusions of environmental impact assessment, inventions, etc.

2.2 Organization of Scientific Research in Forestry Educational Institutions

Selection of scientific and technical developments, which is coordinated by the Ministry of Education and Science, is also carried out on a competitive basis. According to the results of scientific and technical expertise, the following criteria are determined:

- The focus on scientific and technical (applied) results brought to the stage of practical use;

- The compliance of the planned scientific and technical (applied) result with the priority state needs for the development of the economy and society and strengthening national security through the use of scientific and technological achievements, including through the development of dual-use technologies.

The term of scientific and technological developments is up to two years.

The Competition can involve enterprises, institutions, and organizations, regardless of ownership, with the presence of employees of appropriate qualifications and equipment, facilities and resources in this area.

3 Financing of Forestry Reserach (Donor Structure, Application Processes)

Financial support of scientific research in forestry is carried out mainly at the expense of the State budget of Ukraine and funds of institutions, organizations, enterprises, and domestic customers. It consists of general and special (own receipts) funds of the State budget. The main customers of the research, services and scientific advice are forestry enterprises. Scientific research may be financed by means of the local budget, grants, and other sources not prohibited by law.

Research institutions are non-profit organizations that use revenues exclusively to fund their expenses and activities.

Institutions do not distribute received income or its part among the founders (participants), members of the institutes, employees (except for the labor compensation and taxes), members of management bodies and other persons associated with them.

Components of the physical facilities of the research institutes include buildings, structures, land, communications, equipment, vehicles and other tangible and intangible assets. The lands of the forest fund, forest and hunting grounds, and agricultural lands are permanently used by research network enterprises. Revenues from forest products are obtained only by state-owned enterprises of the research network. The research network enterprises are located in different natural and climatic zones leading to a different potential for profit. This significantly worsens the level of staffing and the state of physical facilities of the enterprises with low profits. The mechanism of distribution of funds between enterprises of the research network is absent.

The scientific activity of the enterprises of the research network is aimed at resolving the practical issues of the forest industry in accordance with the "Thematic Plan of Scientific Research of the State Forest Resources Agency of Ukraine" (hereinafter Thematic Plan). Theoretical and applied developments concern a wide range of forestry challenges and have a long-term character (up to 5 years).

In 2017, the amount of funding for forestry scientific institutions to carry out research in accordance with the Thematic Plan was less than 30 % of the need. In 2018, this value has doubled but still remains insufficient. The share of funds from the State Budget of Ukraine, aimed at implementation of the Thematic Plan in separate structural units of the research network, from the total income is extremely low (4–51 %). The constant underfunding of research results in the loss of scientific personnel, inability to improving laboratory facilities and use modern technology that significantly affects the quality of executed work.

The involvement of scientific institutions in solving the practical issues of forestry enterprises occurs through the executing contracts for research and scientific and consulting services. It is mostly short-term, from 1 month to 2 years.

Such cooperation takes place mainly with enterprises located in resource areas (Polissya, Carpathians, partly Forest-Steppe zone). Forest enterprises located in the critical conditions of the South and East of Ukraine have considerably more problems that require scientific support but do not have the financial capacity to carry out research work. The institutes are actively seeking extrabudgetary revenues from research work and services commissioned by other enterprises. However, the difficult financial situation of potential customers of the specified works also does not contribute to the sufficient execution of contracts.

In order to ensure the stable functioning of the forest industry, the SFRA constantly appoints sectoral scientific institutions to resolve current operational tasks requiring appropriate scientific analysis, certain expeditionary studies and substantiation but not stipulated by the Thematic Plan of scientific research of the Thematic Plan and not fixed by contracts.

The tasks, which are brought to the scientific institutions of the industry during the year, concern various issues, in particular the following: the determining the causes for forest dieback, the feasibility of the establishing the nature reserve fund objects in different regions of the country, the overcoming the consequences of natural disasters (floods, forest fires, desertification, ice-loading breakage) and pest and disease outbreaks, the creation of information databases, the feasibility of the establishing bioenergetic plantations of fast-growing species, the design of workstations, etc. Every year an analytical report is prepared for the international institutions on forests of Ukraine and their health monitoring, as well as works are being carried out to comply with the requirements of the Kyoto Protocol. A significant number of tasks are related to the reform of the forest sector. The volume of these works is constantly increasing due to the restructuring of the state system and economic relations in the country. The specified list of tasks is determined not only by the SFRA but is also carried out at the request of the Cabinet of Ministers of Ukraine, other ministries and departments.

Over the past 10 years, as a result of the implementation of such current tasks, scientific institutions of the sector have prepared over 80 legal and regulatory and scientific reference materials, analytical certificates, expert assessments, etc. The time spent for such works is from one to six months, and their cost annually equals about UAH 4.0 Mio. on average. Funding of the priority operational tasks of the SFRA, performed by the sectoral scientific institutions outside the Thematic Plan, should be carried out at the expense of additional funds.

At the legislative level, it is necessary to consider a set of measures on financial resources accumulating and creating conditions for the formation of a special fund for financing forestry activities throughout standard deductions from sales of products by enterprises of forest-resource regions of Ukraine (State Fund for Ukrainian Forestry Development).

The financial and economic analysis of the activities of forestry enterprises of all regions of the country has made it possible to substantiate the mechanism of financing the forest

sector through the creation of the State Fund for Ukrainian Forestry Development (following the example of Poland). Resources of the State Fund are to be allocated to:

- Coverage of the budget deficit of forest enterprises of the sparsely forested regions of the country (mainly in the South and East of Ukraine).
- Financing of forest management, accounting, cadaster, inventory and monitoring of forests.
- Research works by state sectoral scientific institutions.

From the State budget (as in developed countries), only socially significant events should be financed (forest protection from fires and protection against pests and diseases, soil erosion control, the management of the natural reserve fund, the forest road construction, education, and science).

The chief controller of budget funds must necessarily be the central executive authority on forestry issues.

The calculations indicate the possibility of self-financing of forestry operations, protection of forests and research in the forest sector if the following requirements are met:

- Enterprises of forest-resource regions of the country (Polissya, Carpathians, partly Forest-Steppe zone) carry out forestry activities at their own expense.
- In these enterprises, the standard of deductions to the State Fund is being implemented in the amount of 5-10 % of the costs received by forestry enterprises from the sale of forestry products.
- At least 0.5 % of the revenue from the sale should be allocated to the scientific support of the activities of the enterprises.

This will enable to effectively plan revenues and expenditures of economic activity, to determine the value of financial subsidies to enterprises, first of all sparsely forested (steppe) regions, and to ensure the development of scientific research in the forest sector by upgrading physical facilities and a stable salary for researchers.

Creation of a separate fund for Ukrainian forestry financing will provide the opportunity to introduce the principles of self-financing of the sector during forestry works, leaving it to the State Budget (as in other countries) to finance exclusively socially significant activities.

These actions are not possible without the National Forest Policy of Ukraine. Even in many European countries that have been adapted to market conditions much better than Ukraine, reforms in the forest sector of the economy have taken place for 10 years or more. Therefore, such reforms must be carried out in successive stages. The main task at the same time is not to lose control of the forest industry and to maintain a centralized forest management system.

Basic provisions for improving forest management are as follows:

- Improvement of the system of state management of forestry (in modern conditions it is necessary to maintain a centralized state forest management system in Ukraine).
- Optimization of the organizational and production structure of forestry enterprises, science, and education.
- Improvement of the forest financing mechanism (in the conditions of functioning of the state forestry structure and using the experience of Poland it is necessary

to create a special forest budget for differentiated financing of forestry and scientific activities in regions).

- Development of the National Forest Policy of Ukraine.

4 Forestry Research Resources (in Particular Assessment of Forest Land Required for "Research" Purposes Versus the Total Forest Area Allocated to State Research Institutions)

The total forest area of Ukraine's forest fund is 10.4 Mio. ha, including 9.6 Mio. ha covered with forest vegetation. The forest cover of the territory of Ukraine is 15.9 %. Timber volume in the forests is estimated at 2.1 Bn. cbm. The total annual increase in timber volume reaches 35 Mio. cbm.

Forests grow in different natural zones (Polissia, Forest-Steppe, Steppe, Ukrainian Carpathians and Mountain Crimea) and have differences in forest site conditions. The forests are concentrated mainly in Polissia and the Carpathians. Forest cover ranges in different natural zones from 3.7 % (Zaporizhzhya region) to 51.4 % (Transcarpathian region) and does not reach the scientifically sound optimal level.

A third of the natural reserve fund of the state is forest landscapes.

In order to achieve the optimal level of forest cover of the country (within the limits of 19-20 %), it is necessary to increase the area of forests by at least 2 Mio. ha.

More than half of Ukraine's forests are man-made and therefore require intensive tending. The average age of the stands is over 60 years (middle-aged stands make 47.5 % of the forest area); aging of forests and deterioration of their health is gradually occurring.

In many regions of Ukraine, drying forest areas are often emerging. As of May 1, 2018, the area of declining pine forests was more than 150 Thou. ha. Significant areas are occupied by low-value and secondary stands.

About a third of the forests grow in the area of radioactive contamination, some of which are completely excluded from forestry production.

In Ukraine, the multisectoral structure of forest use has been historically established. For forest management, forests are permanently used by enterprises, institutions, and organizations belonging to the jurisdiction of various ministries, other bodies of executive power and administrative entities.

Approximately 0.8 Mio. ha of forests, including strip protective forest plantations, are not provided for use. They are located on reserve lands and are in a poor condition (they are illegally cut and dying from fires, diseases, pests, etc.). In recent years, there has been a significant reduction in the establishing volumes of protective stands.

Almost half of the forests have a limited management regime, which does not contribute to the effective use of forest resources and leads to increased declining processes and environmental degradation.

The area of forest fund lands that used as experimental base for research and implementation of its results is currently 41.1 Thou. ha. About one third of the research work is provided on permanent research sites which are located not only within research network but also in the forests of the state forest enterprises. Currently, there are 1100 permanent

research sites with a total area of nearly 2 Thou. ha. The scientific value of such permanent study areas only increases with time.

Over the years, more than 80 % of scientific research has been carried out in stationary facilities, in line with the Thematic Plan of Scientific Research of the SFRA. Over the past 5 years, due to lack of funds, only about 20 % of the total number of research objects in the network was managed. It threatens the loss of world-renowned research facilities, which negatively affects not only forestry science but also the ability to conduct research in a wider context of environmental protection and management of natural resources.

5 Development of Research Programms Taking into Account Social Demands and Specific Donor Interests (Permanent Research Programms, Ad Hoc Research Topics)

Basic research

- Monitoring of forest ecosystems
- Criteria and indicators for sustainable forest management
- Influence of natural and anthropogenic factors on the productivity and condition of forest ecosystems
- Forest biodiversity conservation and regeneration
- Forest gene resources conservation, micropropagation
- Forest tree improvement (breeding and estimation of selected material, intra- and interspecific hybridization of Pinus, Quercus, Populus, Juglans, and Corylus)
- Wood quality of tree improved material (Pinus, Quercus, and Populus)
- Growth, development and reproduction of forest plants, their adaptation to new conditions, in particular under climate change
- Forecasting spatial and temporal dynamics of insect pests' populations

Applied research

- Principles for forest management on the zonal-typological basis, standards for forest management
- Methods and techniques improving to grow high-yielding and resistant forest and ameliorative stands
- Identification of critical levels of aero-technogenic stress for forest ecosystems; recreational forest use; division of forests according to their economic and recreational purposes
- Development and improvement of forest seed-growing systems to obtain high-yielding and resistant native and introduced forest tree species Improvement of the effectiveness of forest shelter belts and systems of ameliorative stands
- Development of methods to improve the stands resistance to unfavorable biotic, abiotic and anthropogenic factors
- Development of GIS-technologies for forest mensuration

Permanent research program (Ukraine's State budget)

At present, scientists of URIFFM and UMFRI do research into the following topics:

- Improving the methods and technologies of felling in the flatland forests of Ukraine
- Developing recommendations for a comprehensive assessment of the economic potential of the forest resources of Ukraine
- Developing the integrated system of survey, assessment, and prediction of forest pests and diseases for the plain part of Ukraine
- Investigation of an ecological and biological basis of forest-forming species resistance to the extensive pathogenic processes
- Studying state and traits of growth of trees damaged by surface fires and detecting predicting criteria of degradation of these trees in the Steppe conditions
- Improving accounting methods of game animals quantity
- Assessing the current state of protective forest belts and objects of forest recultivation in steppe zone of Ukraine and developing measures to improve the efficiency of the amelioration
- Developing scientific approaches to receive, propagate and study the perspective forms and varieties of forest trees for establishing plantations for different uses
- Improving methods and technologies for mensuration and monitoring
- Modernization of the present forest management GIS, based on up-to-date geodatabase servers and GIS software platform
- To develop a system of environmentally-oriented forest management in the transition to landscape and watershed principle in the mountain conditions of the Carpathians
- To develop environmental technologies of primary timber transportation taking into account forest transportation infrastructure and landscape and watershed approach in the mountain conditions of the Carpathians
- To develop a forecast of sanitary condition and to propose a set of measures to use drying spruce stands in the Carpathians, taking into account environmental, economic, and social approaches
- To develop program and targeted methods of reforestation in cutting areas by using native and introduced tree species and genetic-breeding achievements in the Carpathian region

In 2014, 39 original documents were developed. By 2020, under conditions of proper financing, 24 new output documents will be developed that regulate forestry activities in the plains and mountainous conditions of Ukraine.

A considerable amount of scientific research is concerned with the development of normative documents on the determination of qualitative and quantitative effects of harmful insects and pathogens on the health of forest plantations. These works are funded by the State Budget for forest enterprises in the steppe and eastern part of Ukraine and by the forest enterprises in forest-resource areas. A significant share of revenues under contracts with the enterprises is the scientific research to determine the causes of stand dieback and the development of criteria for predicting their health.

Until 2014, the development of regulatory documents and projects on the biological remediation of soil disturbed by mining was carried out at the expense of mining enterprises and local authorities. Since now these lands are predominantly in the area of the Anti-Terrorist Operation, project development is frozen.

Based on free data management systems, WEB-technology is developed and implemented for the publication of data on forest enterprises' activities on the Internet – the "Forests of Ukraine" Geoportal. Using the geoportal will increase the efficiency of e-governance in the forestry. It will provide a unified electronic access system with a further elimination of paper-based workflow for a unified state forestry structure. "Forests of Ukraine" Geoportal is ready to start throughout Ukraine. To do this, existing forest management data need to be involved and the process of their renewal to be ensured. "Forests of Ukraine" Geoportal implementation is funded by state forestry enterprises.

Forest science must adapt quickly to the current challenges. In modern conditions, the priority areas in use, protection, and reproduction of forest resources that ensure sustainable forest management and innovative forestry development are the follows: the development of methods of forest management, state inventory of forests and forest-pathological monitoring; long-term forecasting of the dynamics of forest health and analysis of causes of negative processes in forest ecosystems; substantiation of allowable volumes of sustainable use of forests under increasing anthropogenic influences and global climate changes, and calculations of investment needs. There is a need for increasing basic research on issues related to the introduction of modern forest genetics and breeding approaches. It is the challenge for that the State budget funds should be directed. At the same time, the forestry research system remains considerably behind both the practical needs of the sector and the international research community by the level of facilities and equipment.

Institutional Challenges of Forest Science Development

- The reluctance of scientific institutions to operate in a market economy;
- The imperfection of mechanism for remunerating of the scientific staff of public sector;
- The outflow of highly skilled personnel in the forestry in general, including scientific workers
- Low level of competitiveness in the domestic and world scientific service markets;
- Lack of effective partnership between the state, science, and business;
- Outdated physical infrastructure.

The scientific institutions are not ready to operate in a market economy because of a low level of competitiveness and imperfect approaches to disseminating scientific products, to intellectual property protecting and developing and maintaining of scientific capacity.

A significant barrier to cooperation between forest science and business is the imperfection of the of scientific staff remuneration mechanism in the budgetary sphere, which does not stimulate highly skilled workers to enter into high-value contracts.

Due to the lack of budget financing of forestry including the enterprises of the research network the outflow of highly skilled personnel, particularly those with English language

skill, has considerably increased. It significantly affects the level of competitiveness in the domestic and world markets of scientific services in the forestry.

According to many experts, the partnership between the state, business and science should include the following aspects:

- From the State: assistance in the development of modern research facilities; encouragement (in the form of privileges) of business organizations to joint research projects in priority areas;
- From the business: informing the State and scientific institutions about the market need in relevant research; reorientation from quick profit to achieve long-term results through innovation;
- From research institutions: establishing technology parks and innovative firms for research based on institutes; reducing the bureaucratic component in their activities, which greatly complicates the dialogue of scientific institutions with business.

Without a radical revision of the approaches to ensuring proper industry support of scientific activity, it is impossible to reach the level of European standards on the methodology of research. Development of scientific and technical capabilities of research organizations of the SFRA is possible through the restoration of lost and the formation of new scientific directions with the simultaneous provision of appropriate facilities and equipment.

Effective action of scientific organizations of the sector is hampered not only by the inadequate funding for research but also by the insufficient level of confidence to the results of research, trends in reducing the prestige of scientific activity, etc. This in turn negatively affects the staffing of the scientists, their professional level and the possibilities of realizing their scientific achievements. The challenge for sectoral science is also the contradiction between the need to provide timely and urgent recommendations for the production and the time it takes to conduct thorough studies.

6 Transfer of Research Results into Practice

6.1 Production testing of research results

The production verification is carried out in a planned manner during the research work, and its necessity is stipulated in the contract for implementation of the R&D works, or in supplements to the contract, including the location and the extent of the verification. Works on production verification can be included in the production plans of enterprises (organizations). According to the results of the verification, the verification act will be worked out. According to the conclusions of the report, the proposals for changes and improvements in the results of R&D works will be made, if necessary.

6.2 Organization of implementation of R&D results

The implementation of the results of complete scientific research is the use of the developed regulatory documents, methodical requirements, scientific recommendations, guidelines, etc. by the enterprises of the SFRA. The Agency proposes the approved R&D results to be implemented into practice by subordinate enterprises on the basis of the Implementation Plan. Annually before June 1, the SFRA brings to the attention of its regional bodies

and directly subordinated establishments and enterprises an updated list of results of complete scientific research recommended for implementation. On the basis of the proposed list, regional bodies, establishments and enterprises under the direct supervision of the Agency determine the level of implementation of new developments and specify the scope of developments that are already being implemented and by September 1 submit information to the SFRA for generalization. If necessary, research institutions (the authors of the developments) may be involved in this activity. By the separate request of the territorial bodies, institutions and the enterprises, directly subordinated to the Agency, the authors of the development provide methodical support and consultative assistance in the formation of plans for the implementation and determination of its specific volumes, methods of calculation of the implementation results and its economic effect. The structural unit of the State Forest Resources Agency on Science and Technology forms an annual IP by October 1 of the current year and sends it by December 1 to the directly subordinated institutions, establishments and enterprises. Works on the implementation of the results of complete scientific research are included in the production plans of the enterprises (institutions). The implementation of R&D results is funded by interested enterprises, organizations, and institution at their own resources. If the implementation, in the opinion of the enterprise where the development is being implemented, did not give the expected result, the reasons are considered by the commission consisting of representatives of the SFRA, the author's team and the enterprise where the development was implemented. After the inspection, a verification report is drawn up, according to which appropriate adjustments are made to the process of the implementation. Subordinate research institutions can organize a model implementation of their developments in the forest area of their subordinate research facilities, the results of which are reported to the institutions, organizations, and enterprises, directly subordinated to the SFRA. The institutions, organizations and enterprises of the direct subordination should reflect the scope of work, the results obtained and the economic benefit that will flow from the R&D implementation in their materials annually, when submitting an annual report.

7 International Research Cooperation

In 1996, URIFFM has become a member of the International Union of Forest Research Organizations (IUFRO) and in 2000, of the European Forest Institute (EFI). URIFFM is the National coordinating center for forest monitoring. The scientists from URIFFM were members of the "Workshop on Methodology of Forest Insect and Disease Survey in Central Europe", of the Commission on Biologic Forest Control in the framework of the East-Paleartic Section of the International Organization for Biologic Control of Noxious Animals and Plants.

URIFFM was involved in the following international fundamental projects of global importance: the project aimed at conservation of genetic resources of major deciduous tree species (EUFORGEN), the programs on forest monitoring (ICP Forests and FHM), the study and conservation of ancient Carpathian forests (FORZA), the analysis into scenarios of sustainable wood production under different regimes of forest management (EFISCEN), the EUROFOREST project entitled "Advanced Technologies Directed towards Shift of the European Forest Sector to Principles of Sustainable Development" in the framework of the

program of international scientific and technological co-operation (EUREKA). In 2004, an office of TechInLis project was established in URIFFM, and several international seminars on advanced techniques for forest inventory and monitoring were conducted as well as an international scientific seminar on the use of GIS-technologies for forest management.

Cooperation in projects: COST ACTION FP1103 FRAXBACK, FPS COST Action FP1102 Determining Invasiveness and Risk of Dothistroma (DIAROD), Cost Action FP1106 (STReESS), UN-ECE ICP Forests, TCP/UKR/3401 – “Forest Policy Consolidation in Ukraine”. MoU - Federal Research and Training Centre for Forests, Natural Hazards and Landscapes of Austria.

Research Institutions pay special attention to strengthening and expansion of contacts with international organizations, participation in joint international projects. URIFFM was a member of the International Union of Forest Research Organizations (IUFRO). Scientists are successfully cooperating with academic institutions in Belarus, Poland, Czech Republic, Finland, the Netherlands, Austria, Switzerland, USA, Germany, etc.

Scientists of UMFRI participate in FORZA and HUSKROUA projects. UMFRI represents Ukraine in the international working groups on implementation of the aims of the Carpathian Convention. Researchers of UMFRI take part in the COST Action CA seminars. A normative document was prepared on establishing criteria and indicators of virgin forests. Proposals have been developed for a strategic action plan for implementation of “close-to-nature” forest management.

8 Integrated Program for the Development of the Research Institutions in the Area of Government of the State Forest Resources Agency of Ukraine

To increase the efficiency of scientific support of the activities of enterprises and organizations of the SFRA, implementation of the results of complete scientific developments, improvement of the activities of the scientific institutions subordinated to the agency and to ensure the further development of sectoral science, the Integrated Program for the Development of the Research Institutions, for which the SFRA is responsible, has been developed for the period 2018-2027.

I. The challenges for which the Program for the Development of the Research Institutions, for which the SFRA is responsible, for the period 2018-2027 has been worked out

- A vulnerability of forest phytocoenoses to climate change;
- An increase of impact of human activities on the environment;
- The lack of objective information about forests;
- Protection of biodiversity through increasing environmental restrictions;
- Forest health deterioration;
- Unbalanced species and age structure of forests;
- Inadequate financial and economic mechanisms of development of forestry science under budgetary constraints.

The effective activity of scientific organizations of the sector is constrained by a flawed system of laboratory equipment supply, an insufficient amount of financing of scientific research, an exodus of scientists, low willingness of forest enterprises to innovations, existing trends to devalue scientific activity, etc. This, in turn, adversely affects the personnel of researchers, their skill level and possibilities in addressing scientific issues up-to-date.

The Program for the Development of the Research Institutions in the area of government of the SFRA, for the period 2018-2027 (hereinafter - the Program) is an important part of the overall strategy of Ukrainian forestry development over the long term. It will serve as the basis for the plans for basic and applied research and organization of activities of forestry research institutions.

The Program is timed and includes the implementation of priority measures aimed at overcoming the crises and stabilize the situation in the sectoral science.

II. The purpose and main objectives of the Program

The purpose of the Program is to promote scientific support in implementing state policy on the sustainable forest management and protection of the environment, the improvement of the efficiency of forestry production by applying modern science-based methods for reforestation and growing of forests, rational use of various functions of forests and adaptation of forestry to climate change.

The main tasks of the Program are the following:

- To ensure the science-based sustainable development of forestry;
- To improve the thematic orientation of scientific research considering forward-looking targets and current challenges in forestry; to develop basic and applied scientific research to obtain new knowledge taking into account the impact of climate change, world trends, and advanced technologies;
- To develop scientific and expert activity of the sectoral scientific institutions and to support their key role in the implementation of scientific forecasting forestry development processes;
- To provide the facilities needed to increase the investment attractiveness of scientific and innovation activities of the sectoral scientific institutions;
- To develop mechanisms for the effective use of latest scientific achievements in forestry production;
- To deepen integration between science and forestry production;
- To establish an innovative technical basis for the scientific activity at the appropriate level;
- To develop international cooperation in forestry;
- Human resources capacity-building, support for leading scientific schools.

III. Basic and applied research priorities

- Design of predictive models for development and health of forests under climate change; development of a climate change adaptation strategy for forests.
- Improvement of technologies for sustainable use and conservation of forest resources, improvement of their quality, conservation of biodiversity of forests.
- Development of mechanisms and principles for the introduction of close-to-natural forestry in Ukraine, increasing sustainability and productivity of forests, preventing natural disasters (floods, landslides and soil erosion, droughts, windstorms, etc.), the effective use of ecological, economic and social functions.
- Improvement of the existing and development of the new theoretical and methodological principles of forestry and forest science, ecologically oriented methods and technologies for forest management taking into account the landscape and water-catchment principles.
- Development of scientifically grounded measures to control forest landscape degradation and desertification.
- Improvement of inventory and monitoring of forests based on mobile geoinformation technologies and means of remote sensing of the Earth; monitoring of forest ecosystems, including radioactive contamination of components of forest biogeocoenoses, to ensure compliance with the requirements of national legislation and international obligations of Ukraine.
- Identification of the special aspects for the formation of complexes of harmful organisms (including adventitious species) and the assessment of their mutual influence on health and growth of stands in a changing climate.
- Creation of new and the study of existing breeding objects using modern cytological and molecular genetic methods for the further development of theoretical (variability and adaptation) and practical (forestry seed collection and storage and silviculture) aspects in forestry.
- Expanding work on the development and reproduction of new varieties of forest species using methods of hybridization, polyploidy and their combination, induced mutagenesis, biotechnology and gene engineering.
- Support of national inventory of forests.

IV. Ways and means to implement the Program

1. Ways to develop scientific and technical potential of research institutions of the SFRA:

- Provision of proper budgetary resources and attraction of investments, including foreign ones, for research and development of scientific infrastructure.
- Upgrading of laboratory equipment, including one for molecular genetic testing and biotechnological research, acquisition of measuring instruments for field work, application of geoinformation technologies, using of modern information technology equipment and computer hardware and software.
- Purchase of modern greenhouse complexes, facilities for processing and storage of seeds, plant setters and machines for soil cultivation and fertilization.
- Purchase of expeditionary transport for effective field research.

- Renewal of agricultural equipment and tractor park of the research network in order to expand research on the experimental base.
- Restoration of lost scientific directions and formation of new ones in forest surveying and inventory, physiology, biochemistry, phytopathology, mycology, hydrology, typology, and mechanization.
- Increasing the professional level of personnel of research institutions, fellowships for scientists in international research institutions, a participation of leading scientists in international programs and grants.

2. Training of high-skilled personnel:

- Strengthening the staff of scientific units will be realized mainly through the training of highly qualified scientific personnel (Ph.D.) by way of post-graduate programs.
- Provision is made to support the specialized Academic Board at the URIFFM that considers the defense of Ph.D. dissertations in the field of forestry.

3. Development of cooperation between the sectoral science and forestry enterprises

The deepening of the integration between science and forestry production will be realized by:

- Executing contracts for carrying out research to address the most pressing issues of forestry management and provision of services.
- Developing the experimental facilities and establishing case study sites on which modern technologies and methods of management are implemented.
- Increasing application of the results of scientific development for the production; scientific support and increasing the cost-effectiveness of the implementation results.
- Approval by the Scientific and Technical Board of the SFRA of the results of the implementation of complete scientific developments.
- The issue of a bulletin of scientific developments approved by the Scientific and Technical Board of the SFRA.
- Seminars and workshops to popularize the results of scientific research.

4. Development of international cooperation includes:

- Identification of priority areas of international cooperation and relevant institutions for joint research.
- Networking and establishing memoranda of cooperation.
- Grant application training for scientists.
- Strengthening involvement in cross-border cooperation.

V. Financial resources to ensure the implementation of the Program

Taking into account that research institutions of the SFRA are budget non-profit institutions, ensuring their scientific activities and implementation of the Program measures are supposed to be carried out mainly through budget resources.

Implementation of the Program will be financed by the State budget, own sources, as well as other sources, including funds from international organizations and foreign investors.

Over 2018-2022, the need for funding of basic and applied research is UAH 52.1 Mio. on average for the year (together with capital investments), including current costs amounted to UAH 36.4 Mio. annually. About UAH 0.8 Mio. for a year on average is required for the training of scientific personnel.

The need for budget financing of research institutions under the jurisdiction of the SFRA is responsible is an average of UAH 41 Mio. per year (together with capital investments).

The total amount of funding for research institutions is significantly influenced by capital investments: the need is UAH 19.5 Mio. per year on average. A significant part of investments is needed for the purchase of housing for young specialists and staff of the institutions, as well as of laboratory and durable equipment, repair and reconstruction of buildings.

VI. Expected results

Implementation of the provisions of the Program will contribute to the effective development of sectoral forestry science and scientific support for sustainable development of forestry in Ukraine.

Execution of the planned activities of the Program will allow the following results:

- To provide proper scientific support of forestry management and its functioning on the principles of sustainable development;
- To create favorable conditions for the effective work of scientific organizations;
- To improve the efficiency of implementation of the results of scientific developments and to increase the skill level of forestry workers;
- To create a science-based regulatory framework and to improve the information support of forest management activities and management decisions;
- To ensure fulfillment of the international obligations of the SFRA on conservation and expanded reproduction of forests on the basis of sustainable development of forestry.