

## **The importance of forestry research for the functioning of the State Forests**

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The history of forestry research goes back hundreds of years, but still there are no grounds for defining the rights, theories and models that would describe, in a sufficiently precise and useful manner, the principles governing the natural and economic processes of forestry management. Even the knowledge of these principles does not preclude the need for replicability of forestry research findings because of the extremely high variability of the object of study. The scope of interest of forest sciences includes, practically, all objects and processes that make up forestry. Their diversity, both material and functional, have led to the formation of various forestry disciplines, from genetics through breeding, conservation and broadly understood use of forests and to end with forestry management and organization. Each discipline focuses on different issues which, with the expansion of knowledge, are still better recognized and understood, and employs other conceptual categories deciding on the nature of the investigated object. A discussion on the importance of forestry research for the functioning of the State Forests should begin from an analysis of the objectives that are set for forest sciences and the relevant methods of research whose findings are incorporated into the State Forests' management practice.

Forest sciences are classified into so-called applied sciences, *i.e.* such that seek to put into practice the findings of basic studies undertaken without any practical purpose, just to explain the phenomena not yet explored and to discover new laws of science.

The main objective of forest sciences in ensuing from their nature is to provide practical knowledge.

Thanks to the laws and principles formulated by forest sciences we can predict what events under given circumstances are going to occur and which are to be circumvented. In other words, the accumulated knowledge of forest sciences let us better organize, plan and forecast the activities useful for forestry management. The research for the benefit of the State Forests mostly concerns the identification of the mechanisms of functioning of forest ecosystems, including factors negatively affecting the state of forest resources, and then the development of rational forestry management methods to, *inter alia*, eliminate or reduce the unfavourable phenomena. This second part of the research always ends with the development of appropriate recommendations for forestry management practice (rules, instructions, directions, *etc.*). As a result of the multifunctionality of forest ecosystems, the achievements of forest sciences not only directly affect or may affect forest economy, but also impact the economic development of the country, land-use planning, landscape and climate development, agricultural production, biodiversity conservation, water relations, as well as increase the ecological sustainability and resilience of different, especially highly industrialized and urbanized regions of the country.

The document *The National Policy on Forests* (1997) points to the increasing threat to forests and the growing importance of their diverse functions which require strengthening of interdisciplinary research. It is postulated to develop a long-term research strategy, useful for forestry, that would aim at the development of the methods for the preservation of the sustainability of forests and continuity of their functions. In par-

ticular, these would include studies on the extent and structure of land coverage with forests, dynamics and sustainability of forest ecosystems, protection and use of forest biological diversity potential, cognitive and applied studies related to forest ecological engineering, safe techniques and technologies of forest operations, development of new forest models and strengthening of the multiple-uses of forests in the economy and social life of the country, improvement of monitoring and forecasting of changes and hazards.

There are five main research institutions dealing with forestry research in Poland, including Forest Research Institute in Sękocin, Faculties of Forestry in the Universities in Cracow, Poznań and Warsaw and the Institute of Dendrology, Polish Academy of Sciences. The Forest Research Institute carries out on behalf of the State Forests most of the research projects of significant importance for the country's sustainable development, both on the regional and global scale, being highly useful for forest practice. The research areas of the Forest Research Institute have always been closely linked with the activity of/in favour of the Ministry of Forestry and Environmental Protection and in support of the business activity of the State Forests.

The Forest Research Institute created the foundations for the protection of forests and their resources, developed the forecasting methods, prepared assessment reports and forecasts of insect outbreaks, tested and implemented new methods and techniques of forest protection. To this day, the Institute has carried out a permanent scientific supervision over insect pest management actions improving the methods of reducing insect populations, replacing chemical preparations by pheromones and biological insecticides. The forest protection services prepare annual assessment reports and short-term forecasts of the occurrence of insect pests, pathogenic fungi, as well as analyses of damage to forests caused by forest animals and industry. These studies are a valuable source of information about threats to forests from harmful agents enabling the organizational units of the State Forests to develop protective strategies, a quicker visual identification of damage-causing agents and a quicker decision-making as to further procedures.

In the period of limited use of chemical plant protection agents, it is very important to seek new methods of reducing the mass occurrence of folivorous insect

pests. For example, formulations based on the use of entomopathogenic nematodes are an efficient biological method of controlling cockchafer grubs in forest plantations. The nematode-based method developed as a result of forestry research is an important element of the integrated cockchafer control method.

The fire protection studies have practical application in forestry management, contributing to the improvement of forest fire protection system and effectiveness of applied solutions, e.g. the modification of belts along public roads resulting in the reduction of expenses incurred on fire protection in the State Forests. A new method of classifying forest fire risk areas was incorporated into Polish legislation by way of an amendment to Annex No. 1 to the Regulation of the Minister for the Environment on the detailed rules of forest fire prevention. It enabled classification according to the uniform criteria at different levels of the country's administrative division. The classification based on the new method allowed the State Forests to apply for EU funding for the forest fire prevention activities.

A rational incorporation of the research findings of scientific institutions into forest practice significantly increased the health condition and resistance of forest stands, the stability and sustainability of forest ecosystems and contributed to the conservation of forest biodiversity.

A modern forest habitat classification system developed in the framework of these studies is also of primary significance for the success of economic activities in forestry and for the protection of valuable habitats.

The studies on the selection and seed production enriched with the elements of forest genetics and genetic engineering have led, *inter alia*, to the development of the rules of seed stand selection, rules of seed and cone classification, as well as industry standards. The conducted studies also allowed to draw up an action plan for the Gene Bank in Poland.

However, the research concerning water management and the impact of forests on water resources made it possible to determine water requirements of trees and retention capacity of forests.

Nature conservation studies are exceptionally important today for the monitoring of natural resources and determining the impact of forestry management on the size of these resources, as well as for the development of the methods of protecting the existing natu-

ral resources, while conducting forestry management. They also provide a scientific framework for the restoration and reintroduction of endangered forest species.

Forest monitoring currently developed on the basis of a network of permanent observation plots (POPs), as well as studies related to carbon dioxide sequestration and forestry management carried out by research institutions are of great practical significance for forestry.

The indicators and net values of CO<sub>2</sub> absorption for forest areas obtained in the framework of CO<sub>2</sub> research are and will be used to determine the CO<sub>2</sub> sequestration potential of forests for the needs of reporting to KASHUE-KOBIZE under the Kyoto Protocol. In the framework of building a forest database, the State For-

ests is creating a system for reporting CO<sub>2</sub> emissions in the forest area and is incorporating research findings into practice using conversion algorithms.

Recent experiences and practice indicate the need to intensify the development of forest sciences and forest knowledge by undertaking new long-term basic studies, particularly those pertaining to the natural basis of forestry.

Looking prospectively into the future of the development of forest sciences, the focus should also be put on finding the ways of using the achievements of all sciences for the conservation and shaping of forest ecosystems in line with the current and future needs and scientific achievements in Poland and in the world.