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The International Newsletter of the Partners of the Millennium Seed Bank Partnership
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Better information for sustainable forest management

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Tropical lowland forest in Panama

PHOTO W. MILLIKEN



Forests and other wooded areas perform key economic and ecological functions. Not only do they provide goods and livelihoods but they also protect soils, regulate water and absorb carbon. Forests also shelter much of the world's biodiversity. The FAO's most recent review on the overall status of forest resources, the Global Forest Resources Assessment, indicates the following data:

- Over 4 billion hectares of the world's land is forest, covering about 31% of the world's land area.
- Close to 1.2 billion hectares, 30% of the area of forest, are managed primarily for wood and non-wood products.
- Only some 7% of world's forests are plantations. At the same time planted forests are expanding and their contribution to global wood production is approaching 50% of the total.
- The world's forests store 289 gigatonnes of carbon in their biomass alone.

In addition, about 1.6 billion people rely heavily on forest resources for their livelihoods. According to a study by the World Bank, 60 million people living in the rain forests of Latin America, South-East Asia and West Africa depend substantially on forests; 350 million people living in, or next to, dense forests need them for subsistence or income; and 1.2 billion people

in developing countries use trees on farms to generate food and cash.

With climate change, forests, with their dual roles in both emission and absorption of carbon, take on a new importance.

There is today a worrying loss of forest habitats and ecosystems – around 13 million hectares per year – through deforestation due to changes in land use or natural causes. Extensive tracts of existing forests are also being degraded to various degrees through damage from pests, diseases, fire, atmospheric pollution, climatic variation and fluctuation, and through lack of management or non-sustainable management practices.

Genetic diversity provides the fundamental basis for evolution of forest tree species. This diversity has enabled forests and trees to adapt to changing and adverse conditions for thousands of years, and has resulted in a unique and irreplaceable portfolio of forest tree genetic resources. Nevertheless,

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The Kostrzyca Forest Gene Bank and its contribution to forest breeding and seed management in Polish forests.

By Czesław Koziół, Director of the Kostrzyca Forest Gene Bank



Above: **Aerial view of FGB**

PHOTO: C. KOZIÓŁ



Top right: **The main hall of the seed extraction plant**

PHOTO: C. KOZIÓŁ

Bottom right: **Seedling growing with *Hebeloma crustuliniforme* fungus**

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The Kostrzyca Forest Gene Bank (FGB), in southwest Poland, is part of the State Forests National Forest Holding. This administrates and supervises more than 90,000 square kilometres of Polish forests. The Kostrzyca FGB, a State Forests unit, is a branch of the Ministry of the Environment and helps the Polish Government fulfil the country's Convention on Biological Diversity commitments. It is active where conservation and reintroduction of trees and other plant species are in progress, and it participates in a series of country-wide and international programmes and projects.

Most forests in Poland grow on quite poor sandy soils and receive little precipitation (approximately 600 mm p.a.), therefore coniferous trees (71%) and in particular Scots Pine (*Pinus sylvestris*) (60%) dominate. Most commonly, forests are regenerated by planting: of 51,433 ha regenerated in 2010 in the State Forests, only 3,867 ha (7.5%) regenerated naturally. In the early 1970s, different tree and shrub species were chosen and registered, and seed storage facilities, seed testing stations and modern plant nurseries were created. There are now 16 seed extraction facilities in Poland, 23 storage facilities including Kostrzyca FGB, 9 seed testing stations and 5 seed control stations. The seed testing centres follow rules similar to those of ISTA (International Seed Testing Association). More than 700 tree nurseries deliver high quality plant reproductive material for reforestation and afforestation. There are also 12 modern nurseries which currently produce 67 million mycorrhizal ball plants per year.

The Kostrzyca FGB, unique in Poland and even Europe, is a part of this well organised system. It is responsible for State Forests' commercial tasks, such as monitoring crops in seed stands, processing and treating cones and seeds, seed storage, seed quality testing as well as the preparation

and stratification of seed lots chosen for sowing. Besides these commercial activities, the Kostrzyca FGB also deals with long-term *ex situ* conservation of valuable forest stands and individual trees, as well as endangered native herbaceous plants. Currently, there are 7,269 gene resources preserved in the bank. Material from the forest districts and gene resources are monitored in Kostrzyca FGB's seed testing station every 2–3 years for traditional storage at -10 to -20°C and every 5 years for storage in liquid nitrogen.

Seeds are prepared for spring or autumn sowing in tree nurseries which produce ball plants in containers treated with mycorrhizal vaccine, also produced by Kostrzyca FGB. Mycorrhization of seedlings with a fungus (*Hebeloma crustuliniforme*) at the juvenile stage helps plants grow and develop in hostile environments (post-agricultural land, degraded land, severe climate or poor / heavy soil conditions etc.). The total production of vaccine is up to 25,000 litres a year. Kostrzyca FGB's Research and Development Unit, consisting of the Cryopreservation and DNA Analysis Laboratories, develops and implements new methods and technologies regarding seed storage, seed testing and DNA analysis with the use of genetic markers. The Cryolab works with recalcitrant, sub-orthodox and orthodox species. Some recalcitrant seeds of species like *Quercus robur* and *Q. petraea* are of special interest. The main task of the DNA Analysis lab is to control the quality of delivered and stored genetic material.

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