LITHUANIAN FORESTS, THEIR RESOURCES AND REFORESTATION

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On January 1, 1993, 30.1% of Lithuanian territory was covered by forests. The forest land occupies 1.92 mln. ha, while commercial stands comprise 1.86 mln. ha. The timber volume is 334 mln. m^3, and the volume of mature stands is 43.6 mln. m^3. Coniferous stands make up 61.6% of land area and volume - 66.9%. Hard deciduous stands comprise 4.7% and 3.9% respectively, and soft deciduous stands - 33.7% and 29.2%.

The major part of forests is in the south-eastern part of Lithuania, which includes about 50% of forest land. In this part of the country pure pine stands prevail. According to tree species, Lithuanian forests include: 37.4% of pine, 24.2% of spruce, 19.5% of birch, 5.6% of black alder, 5.6% of white alder, 2.7% of aspen, 2.7% of ash, 1.7% of oak. Stands of other tree species make up 0.6%.

According to maturity groups, stands are variable. There are only 3.6% of mature pine stands within their total area, and only 1.8% within ash stands. More than a half of aspen stands are mature and together with premature they make up 80%. Premature and mature white alder stands make up 65%. The maturity groups in spruce stands are distributed more evenly.

Average timber volume of Lithuanian forests is about 180 m^3/ha, average volume in mature stands is 244 m^3/ha and average volume in mature pine stands is 285 m^3/ha. The productivity of Lithuanian forests is higher than in Finland, England, Netherlands, France, Italy. Average volume per ha is increasing in Lithuanian forests with the increment of average stand age. If 30 years ago the juvenile stands comprised over a half of all Lithuanian forests and the average stand age was only 34 years, now they make up less than 1/3 of the total area. The area of mature forests increased almost twice and the average stand age reached 49 years. The areas of spruce and ash stands increased during the last three decades, while the areas of black alder and oak have not changed. The areas of soft deciduous stands have been increasing up to the 8th decade, but we have succeeded to stop this process by the help of various forestry measures. As a result, the areas of white alder and aspen stands decreased significantly during the last two decades. The area of pine stands decreased. This decrease was closely related to browsing by large numbers of elks and deer. A lot of pine plantations have been completely destroyed. A better regulation of game numbers and their nourishment is one of the most urgent current problems that require immediate solution.

According to the data of January 1, 1993, over 18,490 thousand ha (93.8 %) of forests belonged to the state forest enterprises. 47.3 thousand ha (2.4 %) belonged to industry, transportation, health-care resorts and other consumers out of agricultural purposes, 41.7 thousand ha (2.1%) - to individual farmers, and 14.1 thousand ha (0.7%) - to cities and towns. Forest management programs for all types of owners are prepared by the Lithuanian State Forest Management Institute, which makes inventory every 10 years and has a data bank on forest fund and its changes. In the period between the wars, during the war and in the post war period forest resources were used too intensively, often exceeding the prescribed cutting volume.

In 1921-1930, 6.4 mln. m^3 of timber were cut annually, in 1931-1940: 6.7 mln. m^3, in 1941-1944: - 6.6 mln. m^3, in 1945-1950: 5.3 mln. m^3, in 1951-1960: 3.8 mln. m^3, in 1961-1993: 3.2 mln. m^3. Apparently, in the period of 1920-1950 forests were cut very intensively. Since 1961 forest felling did not exceed the calculated volume. This affected the forests positively and the productivity had been increasing. Average stand volume per ha has increased from 99 m^3 in 1966 to 180 m^3 in 1993. Total timber volume has increased from 160 mln. m^3 to 334 mln. m^3, the area of mature stands has increased from 5.2% to 9.6% and volume by 13.1%. It should be noticed that during this time almost 2 mln. m^3 of timber per annum were imported from various regions of Russia. Thus Lithuanian forest resources were saved. At the present, it is necessary to increase felling because the area of juvenile growth has decreased below normal, the areas of premature and mature stands have increased too much, and the area of mature stands continues to increase. The State Forest Management Institute, on the basis of the forest inventory data for January 1, 1993, has calculated a planned volume for cutting for the years 1994-2003 as follows:

1994-2003 - 5.05 mln. m^3 per year;
2004-2013 - 5.52 mln. m^3 per year;
2014-2023 - 5.86 mln. m^3 per year.

These calculations have taken into account forestry and nature protection requirements.

In relation to the ongoing Land (Forest) Reform, there are plans made to return forests to former owners (claimants), so their forests are not cut. The forecast is that principal cutting volume will decrease by 25%, and volume of intermediate cuttings will decrease by 15%. It would make up respectively 800 and 720 thousand m^3. It is

anticipated that forest cuttings may decrease by other protected areas where cuttings are limited. Due to the mentioned reasons, actual forest usage up to the year 2000 can be only about 3.7-4.0 mln. m^3 per year. It is possible that after completion of forest return to private owners and when private forestry begins to function normally, cutting volume will gradually increase and in 2005 it will reach approximately 5.0 mln. m^3. According to timber demand and market conditions, the output of timber sortments may change as well, without changing the cutting volume. In 1994-2003 round logs for different purposes (saw logs, construction logs, veneer logs and logs for packing) will make up 45% in the planned structure of timber sortments, while those for paper, chemical processing and wood fuels will make up the rest of 55%. In 2015 cuttings may reach 5.5-6.0 mln. m^3, while improving stand age structure and increasing percentage of mature stands.

In recent years, approximately 8 thousand ha were harvested in clear cuttings, producing about 2.0 mln. m^3 of wood, in all types of cuttings - 3.2 mln. m^3 annually. In 1993 storms broke a large number of spruce stands, and it was necessary to salvage 4.5 mln. m^3 of wood. In such cases, clear cuttings are used. They are most acceptable both from the technical and economical point of view. Approximately 8-10% of trees in clear cut areas are felled by random and selective cuttings.

Thinnings are used in older (21-40 years of age) stands. Later, thinnings are followed up by sanitary cuttings. About 1mln. m^3 of wood is cut annually by tending and sanitary cuttings. Trees are cut and pruned by Swedish "Husqvarna" and German "Stihl" chainsaws. Almost all timber is pulled out by tractors. Russian caterpillar tractors TDT-55 are gradually replaced by more efficient, economic, less soil destroying, self-loading forwarders "Walmet" and "Lokomo". Timber is transported to final stores or wood processing enterprises, or directly to consumers by special trucks. Most of them are made in Russia, such as KAMAZ, URAL, MAZ. Hawser equipment for timber loading in those trucks is replaced by hydraulic equipment "Loglift" made in Scandinavian countries.

Local forest enterprises process only a small amount of wood. In 1993 about 260 thousand m^3 of wood were processed, 100 thousand m^3 of sawn wood, and 24 thousand m^3 used for packing materials.

Up to World War I, 42,000 ha of forest land were planted. In the period between wars, 2,000-5,000 ha were reforested annually. Some pure pine and spruce plantations up to this time prevailed. In 1945-1965, a lot of areas unsuitable for agriculture were afforested. About 15,000 ha of forest land were planted per annum. Many pine plantations were planted very densely (10,000-15,000 trees/ha), which, unless thinned out in time, were unstable and susceptible to damage. In 1960-1970, a number of under-canopy spruce plantations were established. In 1971-1990, when the area unsuitable for farming decreased and clear cuttings were smaller, the area of plantations was reduced to 9,000-10,000 ha annually. Since 1991 the area of plantations decreased to 6,000 ha annually, it was almost equal to approximated final yield area. Due to increasing clear cut areas, the area of artificially reforested stands will reach 8,000 ha by the year 2000.

In recent years the area of natural regeneration has also increased. Now about 20-30% of felled areas with a dense and perspective underwood are left for natural regeneration. Trying to get better use of forest protective functions and natural regeneration possibilities, selective cuttings were applied. Windbreaks in recent years and wood rot in spruce stands forced foresters to apply clear cuttings on major parts of such areas. Due to increase of mature stands, clear cutting sites have recently increased up to 6,500-7,500 ha. In the nearest future clear-cut areas, including private forests, may increase up to 11,000-12,000 ha/annum.

According to the Lithuanian Reforestation Programme for 1993-2000, it is planned to increase afforestation area from 8,500 to 10,500 ha. In state forests the programme is closely followed up. This year we planned to plant 70% of areas with spruce. In the future we plan to plant more pine (20-30%), oak (4%), larch (7%), birch, black alder, less spruce (33%). To carry out the planned reforestation programme, we need 285 kg pine, 376 kg spruce and 82 kg larch seeds annually. In Lithuania total area of seed orchards of all tree species is 610 ha. At present, the storehouse-refrigerator of the Dubrava Experimental Forest Enterprise includes 1,742 kg pine and 1,4687 kg spruce seeds from which 344 kg pine and 892 kg spruce seeds are selective. The available amounts of spruce seeds exceed their demand for several decades to come. Unfortunately, only a small portion is collected from seed orchards.

Depending on soil preparation and site, one-, two-, and currently suggested 1+1-year-old pine, as well as two- or three- and most often 2+2-year-old spruce seedlings are planted. In 1993 seedlings were grown in 323 small seed-beds and nurseries on 2-6 ha areas. In order to improve the quality of seedlings, it is necessary to concentrate nurseries, to use modern technologies, best techniques, to establish watering system. This could be achieved gradually, for it requires large investments. Some 7-10 years ago widely endorsed greenhouses failed due to expensive cover materials and poor equipment.

Due to inadequate quality of planting material and many limiting factors (weeds, pests, diseases, animals), foresters are forced to plant much more seedlings per ha than it is normally needed. Pine is planted 5,000-6,000 per ha, spruce and other tree species - 3,000-5,000 per ha. Higher density is not the best means against the impact of negative factors for growth. Under manifestation of such factors even greater density is helpless, while the absence of such factors leads to overcrowding which requires more frequent, intensive and expensive cleaning and thinning.

The most effective means to control stand productivity and its use are improvement cuts. Early conducted intensive

and regular improvement fellings allow to essentially raise (10-20%) volume increment, and increase final yield from 40 to 80%. While reforesting large areas, every year more than 25,000-30,000 ha were thinned out and cleaned. Gradually this area decreased to 20,000 ha, while at present only 10,000 ha remained. In the future, when clearcut areas will be 10,000-13,000 ha, in order to increase forest productivity, the areas of tending and cleaning cuttings should comprise not less than 25,000-30,000 ha per annum. Thinnings are now more intensive than in the past, therefore it would be sufficient if they were carried out on about 30,000 ha.

In 1924-1994, about 371,000 ha of forest land were drained. At present we still have about 140,000 ha of forest land to be drained. Draining ditches in Lithuanian forests cover a length almost 15,000 km, good ones make up 30%, satisfactory ones - 59% and bad ones - 11%. Every year the number of ditches require repair, and cleaning is increasing. Unfortunately Lithuanian foresters today have no special machinery for forest ditch maintenance and cleaning.

Forest fire problem is significant, especially in the south-eastern and eastern Lithuania in pine stands on dry sites. To extinguish forest fires, fire-protection units with fire brigades are established in all the forest units. In forests susceptible to fire a system of fire watch-towers is established.

Also, a great damage to Lithuanian forest stands is caused by strong winds, uprooting and breaking trees, by animals, by spruce bark beetles, as well as by periodically occurring outbreaks of pests attacking tree leaves. On the average, damaged stands are observed in 200,000-250,000 ha every year.

In 1992-1994 unfavourable climatic conditions developed (hot and dry weather in the middle of 1992 and 1994, strong winds at the beginning of 1993). Spruce stands were weakened very much. In 1994, for the first time in Lithuania's forest history, spruce stands suffered from a mass of *Ips typographus* infestation. Approximately 4,500 ha of spruce stands were damaged entirely and 120,000 ha partially. The volume of dead standing spruce trees makes up about 1.9 mln. m^3. In winter of 1994-1995 all forest districts were felling only dead spruce stands and the work is due to finish by the end of 1995.

Needle-eating insect invasions occurred in 1993 on 30,000 ha area, while in 1994 additional 24,000 ha were infested. In May-June of 1995 needle pests will be controlled from the aircraft on about 16,000 ha area. Much support on this project is received from the Danish Ministry of Environment and Energy and the FAO. The present sanitary state of forests requires maximal attention and investments to remove cosequences of the damages and to implement effective control measures.

The policy of Lithuania's Government in forestry is implemented by the Ministry of Forestry. The system includes 44 forest regions, 4 national parks, the State Forest Management Institute, the State Enterprise of Technology and Projecting "Unksna", the Lithuanian Seed Breeding Centre, the Centre of Forest Market Economy, the Forest Seed Control Station, and the editorial staff of the journal "Musu Girios". A forest region is an institution of state forest management and regulation, which restores, tends, and utilizes state forest resources according to an established order. Taking into account forest situation, scope and intensity of management, forest region (excluding the forest enterprise of Kursiu Nerija National Park) has 18-78 thousand ha (on the average 45 thousand ha) of forest land which is divided into forest districts and sectors of forests guards. On January 1, 1995, there were 503 forest districts in Lithuania. The average area of a forest district is 4,100 ha. The forest district is a territorial production unit of forestry, the functions of which are forest protection against fires, violations, diseases and pests, reforestation, tending of stands and harvesting. A forester, who must be silviculturist, experienced in practical work and having college education, manages a forest district. Forest districts are divided into protection sectors by guards (the average of a forest guard area is 800 ha). There are 2,432 forest guard sectors. The sector of a forest guard is a territorial unit formed to protect forests from illegal cutting, plundering, fires, poaching, illegal haymaking, pasturing and other forest violations. The forest guard takes care of the sector and carries out some other physical work.

In Lithuania we manage 5 national parks, 30 regional parks, 5 reserves, 290 various nature preserves. Most of them are within the forests. These protected areas comprise 718,5 thousand ha or 11% of all the territory of the republic.

In 1994, 4.6 thousand of employees worked at forest enterprises and other forestry organizations, and included about 7.3 thousand of physical workers.

At the end of 1994 the Forestry Act of the Republic of Lithuania was approved by the Parliament for the first time in Lithuania's history. It is a document of historical value that strictly obliges forest owners and managers to carry out reforestation and tending in forests of all types of ownership. The Act obliges to reforestate clearcut areas and artificially burnt areas within two years. Forests must be artificially regenerated by seedlings (or seeds) of selected origin on the basis of genetics and ecology. Reforestation must include reconstruction of stands of poor quality, complementing them with plantations (artificial and natural ones), their protection and tending until the young forests form. Dead plantations must be reforested within two years. Oak, maple, lime, ash and pine stands cut and grown in suitable sites must be reforestated by the same tree species. The Ministry of Forestry must organize the protection of the forest genofond, establish selective seed-breeding program, and define requirements for seeds and seedlings. The most important points of the Forestry Act are clarified and specified in special regulations, the greater part of which have been already prepared and will be presented in the nearest future.