FOREST ECONOMY IN ESTONIA

DR. rer. for. PAUL REIM

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ADMINISTRATION OF STATE LANDS AND FORESTS AND THE ESTONIAN INSTITUTE OF ECONOMIC RESEARCH

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SUMMARY

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ESTONIAN FORESTRY

1. Forest Resources.

Natural conditions in Estonia for the development of her forest resources are in all respects favourable, as compared with other European countries, the chief advantages being: her position on the border of the sea, the comparative shortness of transport routes from the forests to the harbours and thence to foreign ports; a sufficiently dense population ensuring an adequate supply of labour; a climate suitable for forest vegetation, long winters with prolonged sledding facilitating inland transport; and an important stock of commercially valuable species of timber trees.

The forest area in Estonia in 1932 covered 930,000 hectares or 20.5% of the total area of the country. Besides on forest land proper, there is a comparatively plentiful growth of forest trees on natural pastures and meadows.

As regards the state of ownership, approximately four-fifths of the forests belong to the State. A small part of the State-owned forests has been reserved to the University of Tartu and the Ministry of War for special purposes. Where the designation State forests is used in this review it is meant to include only such forests actually under management by the Administration of State Forests. A comparatively large proportion of the forests belongs to municipalities and industrial concerns, and about 17% to owners of small rural holdings.

The forests are not uniformly distributed over the area of the country. The largest timbered regions are found in south-west and south-east Estonia. Out of a total forest flora of over 70 species, the following are of silvicultural importance: pine *(Pinus silvestris)*, spruce *(Picea excelsa)*, birch, asp, common or red alder *(Alnus glutinosa)*, white alder *(Alnus incana)*, oak, ash, Scotch elm *(Ulmus montana)*, Dutch elm *(Ulmus effusa)*, maple, and lime. Of the State forest area, in 1935 pine forests covered 41.8%, spruce forests 29.2%, and deciduous broad-leaved forests 29%. In the latter, birch predominates. Asp and common alder account each for 2.1%, and oak, ash, elm, and lime together for 0.1% of the total managed area.

The pine forests grow generally on lean soils, such as dry sandy grounds, thin moulds, and turf-moss. Those localities with predominant pine growth lie mostly along the border-line of the country. The largest pine lands are to be found in north-west Estonia. This region is, however, generally thinly wooded and abounds in glades grown with broad-leaved trees, which accounts for the latter taking in some places a bigger share in the timber crop than spruce. The finest pine forests are met with in south-east Estonia, where this species clearly prevails in the arboreous vegetation. The best pine forests often attain an average height of 35 metres, with individual trees reaching a height of up to 40 metres.

Spruce forests are to be found generally on fertile moraine grounds, the areas predominantly stocked with spruce coinciding with the best arable soils, which are situated mostly in the central regions of the country. In the northern portion of Estonia the spruce forests grow on flat and uniform tracts, and this species strongly predominates. In the southern portion of Estonia they often appear on broken country, and their height and yield capacity is generally greater than in the northern regions.

Spruce woods with broad-leaved species predominating are found in the low river plains. These areas are mostly sparsely inhabited, and the marketing of low-grade timber materials is therefore as a rule more difficult than in the spruce and pine regions which are generally more densely populated.

Among deciduous foliage trees, birches *(Betula verrucosa* and *Betula pubescens)* are the most plentiful trees.

Aspen prevail principally in south Estonia; common alder growns on the banks of rivers and brooks; white alder is very abundant in the farm woods, but is an unimportant species in the State forests. Oak, in prehistoric times widely distributed over the country, is now rarely growing on extensive areas, though smaller oak forests are found in north Estonia and on the island Saaremaa. On the western shore oak trees are frequent on natural meadows. Ash trees are met with in mixed foliage woods almost everywhere, and there are ash forests in places. Elms grow sporadically on rank moraine soil and along rivulets in clumps, but do not form forests. Linden appear chifly as primitive woods, often forming rankly growing scrub. Of foreign species, larch *(Larix sibirica* and *Larix europaea)* is most frequent.

The share of spruce wood in the total production of timber is double that of pine. Birch has an equal share in the production and in the wooded area, whereas the relative importance of aspen is sensibly higher in the former than in the latter.

The mass of wood in forests ripe for the axe is on the average approximately 200 cubic metres per hectare. The largest yields are obtained in mixed spruce and pine forests. The average mass of wood in mature broad-leaved forests is somewhat higher than in mature coniferous forests. In north Estonia it is appreciably smaller than in the south. The average mass taken upon the total forest area is about one-half of that yielded by mature forests. According to Professor Mathiesen, the average mass in the State forests, including also cut-over and treeless areas, may be estimated (1928) at approximately 97 cubic metres per hectare. In the present review it has been taken as roundly 100 cubic metres per ha. of the total area under forests. This would correspond to an aggregate mass of 93 million cubic metres. This amount does not include the timber mass contained in trees growing on meadows and pastures, which are of great importance in the total yield, and may be calculated, on a rough estimate, at 15 million cubic metres or one-sixth of the total forest mass.

Accurate investigations as to the yearly increment of the Estonian foreststs have not been carried out. Prof. Mathiesen estimated (1926 and 1928) the net increment at approximately 3 m^3 solid per hectare, and the gross increment, at about 3.4 m^3 solid per hectare and year.

The greater part of the forests belong to the IInd and IIIrd quality classes. The presumptive yield capacity of the timber land calculated upon the normal state of the forest (4.27 m^3 solid per ha) is estimated at about 25% above the present gross increment and about 40% above the present net increment. Of the total productive capacity, pine forests account for 37.3%, spruce forests for 34.2%, birch forests for 23.0%, asp forests for 2.8%, common alder forests for 2.1%, and other foliage trees for 0.6%. The yield capacity of the entire forest area of 930,000 hectares would thus figure out at around 4,000,000 cubic metres solid.

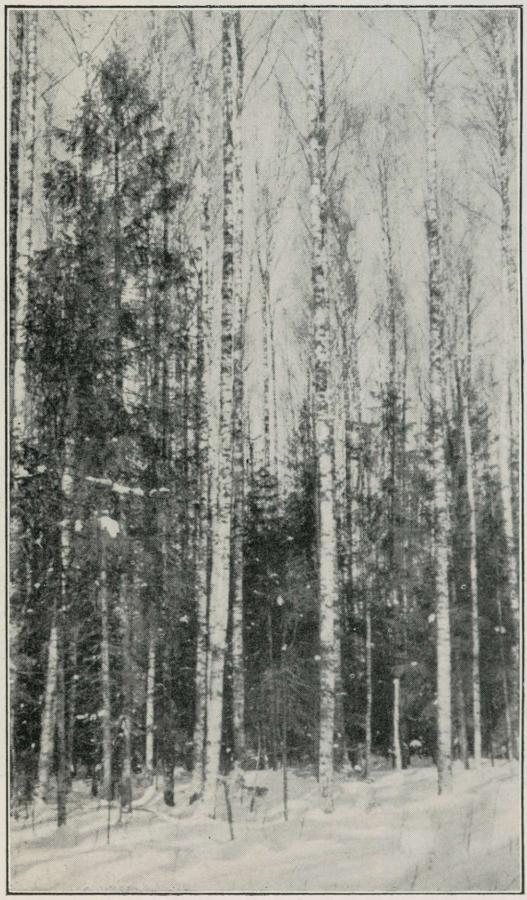
2. State Forests.

With the proclamation of independence the former Russian crown forests became the property of the State. To these were added in 1920 the private forests nationalised under the Land Reform Law. In 1918 the administration of the State forests was entrusted to the Ministry of Agriculture and has since then formed one of the most important tasks of that Ministry.

The central institution directly in charge of the administration, management and working of the State forests is the Administration of State Lands and Forests. It is divided into four departments, viz.: the Bureaus for the management, forest

Above: Forest-lake. Aegviidu forest district.

Below: Mature pine forest. Experimental forest station of the Tartu University.



Above: 100 years old pine forest. Voltveti forest district.
Right: Mature pine forest. Permisküla forest district.
Left: Birch forest (55 years). Permisküla forest district.

economy, and sale of forests, and the State Land Office. The first three are concerned with the economic and administrative management of the forests, and the last-named one, with the administration of national agricultural lands, and the lease and sale of settlement farms. The central institution, with the headquarters in Tallinn, is presided over by a director, under whom are his deputy, three forest commissioners, one inspector, one adviser, and a secretary.

There are at present 102 forest districts, each in charge of a chief forester, 26 of whom are called supervisors and are charged, besides with the supervision and management of their respective ranges, also with the inspection of three adjoining districts. In the larger districts assistant chief foresters are appointed. Besides, each forest district has 2—4 rangers, 10—25 forest guards, a secretary, a clerk appointed by the State Timber Industry, and 1—3 appraisers.

The management of the State forests is based on working plans elaborated by the Bureau of Forest Management and approved by an advisory committee. In the early years of the Republic, 1920—22, simplified plans were prepared. Rational silvicultural treatment on economic principles was started in 1923. Under the regulations in force, working plans are prepared for a period of ten years. Actually, however, the operation of the plans extends over longer periods owing to the limited technical staff of the Bureau of Forest Management not being always able to prepare new plans within the required time.

The felling in the State forests is done by a system of clearing cuts of a width usually not exceeding 50 metres. Intermittent cuts, leaving intact a specified number of trees at the edges of the clearance to protect young growth, are practised in pine forests, while in spruce forests successive and gradual cuts are in some places applied.

The felling quotas in a given region are dependent on the extent of the wooded area concerned. With a view to greater uniformity of the production of timber, it is required that the average quality of the timber to be cut within 10 years in a given wood lot should correspond to the average quality class of the whole range. The felling quotas are fixed by ranges, of which there are often several in a district, according to the ageclass system separately for each more important species. The maturity marks have been fixed at 100—120 years for pines (raised, in places, in the I and II quality classes up to 160 years in order to obtain suitable timber for shipbuilding purposes), 80—100 years for spruce, and 60—80 years for broad-leaved trees. In 1935 the total annual felling area was 6,274 hectares or 0.9% of the area under State forests. Clearance cuts are also undertaken, the dead timber cleared being sold to local inhabitants.

The sale of standing timber to be cut is effected in three different ways. A part is sold by auction, arranged in two ways, viz., public auctions at which anybody is entitled to bid and the buyer is at liberty to dispose of the timber bought at his discretion; and so called limited sales arranged for local inhabitants only who are not allowed to resell the material acquired by them. Secondly, the wood lots are put up for sale at fixed prices; sometimes timber is given to institutions free of charge. The remaining portion is cut and worked up by the State Timber Industry and sold by it on the private market or to the local population. Of late years the quantity of timber sold by auction had diminished, while that of timber worked up at the expense of the State has fairly regularly increased. Since 1936 the sale of standing forest by auctions is stopped.

The bulk of the standing timber put up for sale is not cut in the same year, owing to which the amount actually sold differs from the quantum destined to be sold under the respective felling contingent. In 1925—34 the average annual felling of timber from the State forests has been 2,110,000 cubic metres, made up as follows:

77.2% by regular or final cuts, 2.6% by cuts in advance, 20% by dead wood, and 0.2% by stump (v. table No. 17). In addition to this, an average amount of 355,000 m³ has been cut annually by order of the Administration on lands parcelled out for settlement.

The regeneration of the forests is done by natural and artificial reproduction. During the last decade an area of approximately 3,850 hectares has been taken under cultivation in each year. Sowing is generally preferred to planting, about five times as many new cultures having been set up by the former method.

The area newly cultivated in recent years represents approximately 40% of the cutting quota. There are many ranges in which all cut-over areas are replanted. In others only a trifling portion of the denuded areas is artificially reforested, the rest being applied to natural regeneration. More forest-planting is being done in densely populated and sparsely timbered regions than in thinly populated well-wooded areas with predominating moist and boggy soils, on which forests regenerate in the natural way.

Tracts with predominant spruce growth have until now been reaforested mainly by planting. The regeneration of essentially pine forests is largely done by sowing, the ratio of pine cultures to spruce plantations formed by this method being 6 : 1. Of the replanted area, spruce cultures account for 65% and pine cultures for 30%, the remaining 5% being made up by imported species and native foliaceous trees. The foreign species grown in the nurseries are mostly ornamental trees. In isolated districts, however, whole groves of foreign forest trees are met with (mostly larch, especially *Larix sibirica).*

In several forest districts (Sõmerpalu, Kabala, Weriora, Piirsalu) mixed cultures of pine and spruce are sown. In others this is only done in cut-over areas formerly grown with mixed forests of these species. These mixed cultures represent from 20% to 30% of the total area recultivated by sowing.

In order to raise the yield of the State forests, new drains of a length of about 200 kms have been dug, and old ones of a length of about 400 kms have been cleared annually during the last few years. The plans for these works are drawn up partly by experts of the Ministry of Agriculture and, partly, by the local foresters.

In young State forests around Ekr. 20,000 annually has been spent of late years on clearance cuts, the extent of which is generally increasing. In localities with good marketing conditions these cuts are carried out by the buyers themselves who either get the timber cut entirely free of charge as remuneration for the work, or pay for it a certain sum to the Administration of State Forests. In middle-aged forests clearance cuts are mostly undertaken by the State Timber Industry.

In view of the increasing use in recent years of motor vehicles for the transportation of timber, systematic work is being done in the State forests for the improvement and development of roads, now under the supervision of an expert engineer appointed by the central controlling institution from the beginning of 1937.

Measures are taken in the State forests to combat noxious insects, such as the bark-boring beetle (Ipidae), Hylobius, Abietis, Pissodes piniphilus, Fidonia piniaria, and Lophodermium pinastri. To reduce their propagation the stumps on cut-over areas are barked. Unlawful cutting of trees has generally diminished since the coming into force of the new Forest Law (1934), but in certain districts these offences are still causing the forest-officials much trouble.

In order to reduce the danger, and facilitate the extinction of fires watch-towers have been built in dry forests, and the vistas are kept clear of scrub.

Besides for the supply of timber, the State forests are utilised for a variety of purposes, chief among which are: grazing, haymaking on clearings and vistas, and the sale of moss, peat, sand, gravel, and

Above: Naturally grown spruce forest on a farm in N. Estonia.
Below: Spruce forest after clearance felling.

Above: Nursery for ornamental trees at Tõrvaaugu. Kabala forest district.
Centre: Nursery at the Voltveti School of Forestry.
Below: Nursery at Kohtla forest district.

clay. Great care is taken of the propagation of game. Hunting is permitted against a payment of a fee, and a part of the State forests is let out to hunting-clubs.

The State foresters are also performing certain functions as representatives of the Ministry of Agriculture in matters concerning the administration and sale of State-owned agricultural lands.

The State Timber Industry at Tallinn is an independent Government institution, operating apart from the Administration of State Forests. From the beginning of 1937 the Industry has been remodelled on the lines of a limited liability company, 95% of the shares of which are held by the Government..

The State Timber Industry receives timber from the State forests at the assessment price through the Budget; the respective lots are worked under the supervision of the Government foresters. The timber is sold by the Industry to State institutions, local inhabitants, industries, and timber merchants. Since 1936 the State Timber Industry is also engaged in the direct exportation of timber materials.

3. Other Forests.

In 1921 the Ministry of Agriculture reserved to the University of Tartu for educational and experimental work the forest district of Kastre-Peravalla of a total area of 8,440 hectares, including 3,878 ha of woodland. The district is in excellent condition. Much forest land has been reclaimed by drainage. The main drainage canals are well fitted for floating, and the roads are in an exemplary state.

The experimental forest station is administered by a professor of the silvicultural section of the faculty of agriculture of the Tartu University. The station also supervises the woods of the biological research station at Kuusnõmme on the island Saaremaa and the dendrological park at Raadi.

The forests are worked up by permanent workmen, but no standing timber is sold. There is a sawmill, and a brick factory has been set up with a view to utilising the cheap fuel available.

The forest station at Kuusnõmme, situated on the western shore of Saaremaa, permits to study matters in connection with woods growing on chalky soil and, at the same time, to make biological observations of the fauna of the extreme western portion of the country. The students of the Faculty of Natural Science are making there a part of their obligatory practical studies.

A forest area of 9,900 hectares, including 78% of coniferous woods, has been reserved to the Ministry of War. Cutting operations in these forests have been effected on a moderate scale.

Of the municipal forests, the largest area belongs to the town of Pärnu, totalling 5,460 hectares, of which 60% is under conifers. The timber produced is partly used up for the needs of the municipality and, partly sold by auction. The working of the forests is since 1884 done according to regular working plans.

The town of Tartu possesses 2,835 hectares of woodland. Spruce prevails in 85% of this area. The forests are managed under working plans.

The wooded area belonging to the Tallinn municipality amounts, according to data available for 1932, to 2,877 hectares, of which coniferous forests account for 81%. The forests are situated on arid soil.

The town of Narva, with a timbered area of 1300 hectares, also plays a noteworthy part in municipal forestry. The share of the other towns is less important. The town forests are generally well managed.

The largest industrial forest property is that of the Narva Cloth Manufactory. Other owners are, *inter alia:* Narva Linen Factory Ltd., Kreenholm Cotton Mills Ltd., Paper Mills Koil Ltd., Northern Paper and Pulp Works Ltd., and Järvakandi Glass Factory. The old-established concerns have generally husbanded their forests properly.

Farm forests, according to data ascertained by the agricultural census of

1929, cover an area of 160,140 hectares, or 5.2% of the total farm area. The total number of farm holdings being 133,357, an average forest area of 1.2 hectares per holding is arrived at. It should, however, be observed that while a large number of farms do not possess any wooded property at all, there are isolated holdings owning over 50 hectares of forest land. It should also be borne in mind that no clear distinction can be drawn from the census returns between woodland and pasture land. It is, indeed, possible that the same tract is listed under both heads: young forests which are fit for grazing are generally classified as pasture land, and the same applies to sparsely grown cut-over forest areas. This accounts for the fact that the great majority of woods are described as of middle age (20 to 40 years old) and but a comparatively small portion is listed as young or old (over 60 years) forest.

Very many owners of old freehold farms are keeping their woods in good order and have done much towards the improvement of the country's forest resources.

The farm forests are not merely a stock of wood needed for domestic purposes, but rather an important source of income, besides providing work for a large number of people. Not infrequently cheaper grades of wood are purchased for the requirements of the farms, while the more valuable produce of their own woods is sold at higher prices.

Felling of farm woods in independent Estonia has generally been on a larger scale than before the World War. Of late years, however, the understanding of the need for proper treatment on sound principles of forestry has spread rapidly among settlers and small farm-owners also.

The total cuts in all the forests during the period 1924—1934 amounted to approximately 3,7 million cubic metres, or 900,000 cubic metres (32,2%) in excess of the net increment. Cutting in the State forests during the same period has been approximately equal to, but in the farm forests it has been about 15% above, the yearly net increment. Felling has been particularly extensive in the settlers' woods situated on lots distributed to new settlers under the Land Reform Law with the understanding of their being subsequently converted into arable land. The excessive cuts effected on these tracts are thus largely a result of the operation of the radical land reform, and as the execution of the latter is gradually coming to an end, it is to be hoped that felling operations will considerably diminish in the near future.

4. Timber Industry.

The industries engaged in the working up of timber produce are of outstanding importance in the industrial life of Estonia. According to data covering the period 1924—34, these industries are responsible for from 23% to 28% of the entire net production of Estonian industry. They also account for from 40% to 50% of the motive power used by the local manufacturing industries, from 21% to 24% of the total wages paid to industrial workers, and up to 50% of the total industrial exports.

Sawmills are the most numerous class of industrial enterprises in Estonia. They are operating either as independent undertakings or in combination with other industries. Thus, in the rural districts, pit-saws have been fitted up at all bigger water-mills.

Modern sawmills have been set up in the larger timber producing centres, Pärnu, Narva, Tallinn, and Tartu. Most important among these is Pärnu with four large and a number of smaller mills. In Tallinn the biggest sawmill belongs to the State Timber Industry.

Work at the sawmills bears a seasonal character, beginning in February-March and lasting up to June or later, according to the supply of logs. The aggregate output of the mills averages round about 60,000 standards of sawn timber a year, for which around 500,000 cubic metres of raw material is used. Of the total production, from 15,000 to 20,000 standards are sold locally, the rest being exported.

The only plywood industry in Estonia is A. M. Luther Ltd., at Tallinn. The output of the Works in recent years has been about 18,000 tons a year, 90% of which is exported. Besides plywood and articles made therefrom furniture is turned out on a large scale.

The plywood Works consume approximately 69,000 cubic metres of raw materials, mostly birch and alder wood as well as a certain quantity of coniferous timber.

Prior to the War the industry used a larger amount of timber which was, however, mostly of Russian origin. The Works, capable of utilising the entire raw material produced in Estonia has, whenever possible, purchased birch blocks from abroad.

The furniture industry, which is showing signs of steady expansion, uses as raw materials both coniferous and broad-leaved timber. In addition to the local deciduous hardwoods, chiefly ash, elm, and oak, a large amount of more expensive foreign timbers are imported in the form of boards and veneer, the principal kinds being mahogany and oak.

The box board industry consumes coniferous wood and a small amount of aspen blocks. The largest business in this section is the Järvakandi box board factory which employs 150 workers. A number of smaller enterprises exist in Pärnu, Viljandi, Tartu and Tallinn.

The paper industry is one of the older branches in Estonia. Among the bigger establishments, the Northern Paper and Pulp Works Ltd. with a yearly consumption of 450,000 square metres of pulp wood are ranking first. Besides the paper and cellulose mills situated at Tallinn, the company owns an extensive pulp works at Jägala and a smaller one at Tammiku.

Next in importance are the Türi Paper Mill, with an annual consumption of 15,000—30,000 square metres of pulp wood, and the Koil Paper Mill at Kohila, using about 15,000 square metres of pulp wood. The Tallinn Paper Mill J. Johanson, Ltd., ranking among the larger paper industries, uses as raw material cellulose and pulp manufactured by other local mills. In addition to the works enumerated above, there are a number of pulp mills of smaller size in different places.

While the output of paper has been on the downgrade since 1925, that of cellulose has been showing a continued increase. Production of pulp, which is for the most part consumed locally, has been on a stable level since 1924.

As raw material pulpwood of a thickness of from 10 to 20 cm. is used. The industry is capable of utilising the entire local supply of raw material, in addition to which Russian wood has been purchased on several occasions. Domestic consumption of the output of the cellulose industry being from 6,000 to 8,000 tons a year, between 60% and 80% of the output is shipped abroad.

In 1938 a new sulphate cellulose works is to start operations with a prospective output of from 20,000 to 30,000 tons yearly. This works is adapted to utilise the thinner descriptions of pine and aspen wood.

In 1928 the match factories then existing in Estonia were transferred to the Swedish Match Company. Since that time the output of matches has declined and a part of the factories have been shut by the company. At present only one factory, at Viljandi, is in operation. Local consumption of matches has, owing to the rise of match prices following the transfer, steadily fallen, viz. (millions of boxes): 1927 — 54.5; 1929 — 29.9; 1931 — 24.9; and 1936 45.5. About 70% of the production is sold abroad. The amount of match-wood used varies between 3,000 and 9,000 cubic metres a year.

5. Use of Timber Products.

Timber is as yet the most important building material in Estonia, as is shown by the following data. At the 1934 census there were 192,020 dwelling-houses, of which 172,617 or 89.9% had wooden walls and 54.7%, i. e. over one-half, were roofed with wooden materials (shingles and the like).

The supply at reduced prices of timber building materials from the State forests for the needs of new settlements created under the Land Reform Law between 1924 and 1933 reached about 245,000 cubic metres yearly. The existing old farm buildings contain wooden materials estimated at some 15 million cubic metres. The amount of timber required for repairs of these houses and for the construction of new ones is about 250,000 cubic metres yearly.

Prior to the crisis the proportion of timber materials in urban buildings showed a tendency to decline. During the depression, however, the heavy fall in the prices of timber caused a renewed demand for wooden building materials in towns, and only recently, owing to measures taken to stimulate the use of fireproof materials, there has been a change in latters' favour. Timber for construction is used in the form of beams and joists and, to a less extent, in that of boards, wooden tiles, and shingles. The increasing economy of wooden materials in modern construction technics and the widespread application of means raising the durability of walls (stone-lining and plastering) is apt to reduce the use of timber materials in wooden structures in the future.

For bridge construction, railway sleepers, telegraph and telephone poles, and posts for electric conductors roughly 60,000 cubic metres of timber is consumed annually. For sleepers pine and spruce beams are used, the latter requiring preservative impregnation.

With a total length of the railways (incl. sidings), as at April 1, 1934, of 2,086 kms, of which 1,204 kms were broad-gauge and 882 kms narrow-gauge, the number of sleepers required for the lines is approximately 1.8 million and 1.3 million, respectively, representing an amount of about 370,000 cubic metres of timber. At the normal renewal rate of $^1/_{15}$ per annum, round about 25,000 cubic metres of timber would be required yearly for replacement, but the actual amount is appreciably higher owing to the construction of new lines. In addition, the railway service uses a large quantity of timber for station buildings and switch-blocks.

For telephone and electric poles chiefly pine and, occasionally, spruce logs are used. In 1933/34 the telephone lines controlled by the Administration of Railways had a total length of 10,810 kms, and the number of posts wanting renewal in that year was 162,768. Besides the postal telephone service, there is a great number of lines owned by the railway administration, the Army, as well as industrial and other private enterprises. The amount of timber used for poles in 1935—1936 averaged 12,700 cubic metres a year, as compared with 10,000 cubic metres ten years previously.

The use of wood fuel for railway engines has decreased in recent years. The engines are heated mainly with oil-shale. Before the World War the railways consumed as much as 90% of wood for fuel, whereas by 1930/31 the proportion had fallen to 5%.

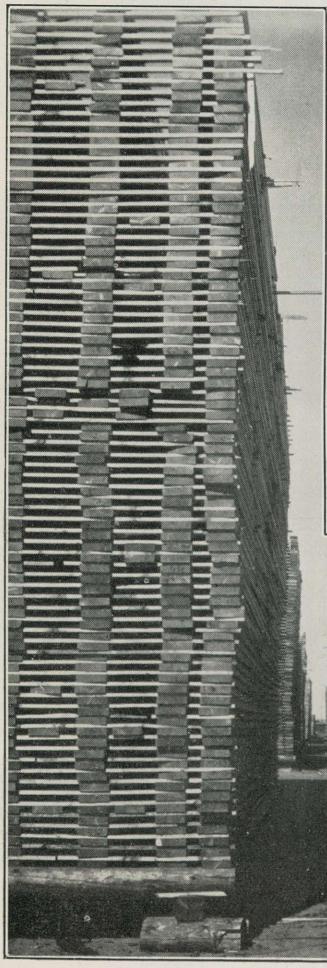
The importance of wood as domestic fuel is much greater in Estonia than in southern countries. As fuel are used: billet wood, faggots, stumps, and various kinds of waste wood, such as sawdust, chips, waste of timber-yards and sawmills.

Besides firewood, oil-shale and peat are important as fuel. Oil-shale is mostly used for central heating installations in towns, while the latter is also widely used in the country, especially in poorly wooded localities. Wood waste, oil-shale and peat together have during the last ten years covered approximately 20% of the total requirement of fuel, the remaining 80% being accounted for by billet wood and faggots. The average yearly consumption of firewood in 1929—1934 amounted to 400,000 cubic metres in towns and 1,900,000 cubic metres in the country, making 1.15 metres per town inhabitant and 2.48 metres per rural inhabitant.

Timber produce represents about one-half of the total freights carried by the railways.

The average yearly out-turn of timber during the last ten years has been ap-

Felling in Avinurme forest district.
Students of Voltveti School of Forestry busy working up a clearance.



Staple of paper-wood of the State Timber Industry at the railway station Tapa.

Staple of aspen blocks at Tallinn harbour awaiting shipment.

Piles of planks at a sawmill of the State Timber Industry.

proximately 4.3 million cubic metres, of which 22.7% was exported. Domestic market requirements have varied between 50% and 60% of the normal yield of timber. All firewood produced has been absorbed by the local market.

The income derived from the State forests has generally been between 8 and 12 krones per hectare and year. About ¼ up to ⅓ of the income has been spent to cover managing costs. The net surplus realised has varied between 4.15 and 8.46 krones per hectare a year. The per hectare income from the best timber regions with favourable transport conditions is, however, considerably higher. Private owners being able to save a part of the working expenses paid by the State to industrialists, the net returns from private woods are probably generally higher than those obtained from the State forests.

6. Exports and Imports of Timber Produce.

Exports of timber materials from Estonia are fifteen times larger than the corresponding imports. They embrace a variety of articles ranging from raw materials up to paper and matches. The imports include the raw products for sawmills, plywood and paper factories, different valuable timbers for the furniture industry, as well as staves and hoops for casks required by the butter export trade.

Most of the local timber produce is exported in the shape of plywood, cellulose, and paper. Shipments of round timber include logs, pit-props, and hardwood blocks. Of late, however, exports of these items have been reduced in favour of manufactured articles, such as cellulose, plywood, boards, and matches.

Markets for Estonian timber produce have been found in all parts of the world, but the most important one has been England, taking up nearly 80% of the sawn timber and 90% of the props exported. The major part of the goods are sent abroad by sea, the principal export harbours being Tallinn and Pärnu. The amount of raw timber used for the manufacture of these exports averages 1 million cubic metres a year, the top figure being attained in 1928 and 1934 at 1,250,000 cubic metres, and the lowest, in 1932 at 600,000 cubic metres. For the last decade the material for export timber products represented approximately 23% of the total out-turn and 57% of the total sawn timber output.

Of the two rival staple exports, dairy produce and timber produce, the latter was holding the first rank up to 1926 and has recovered it again in the years after 1934. In the latter year the value of these exports amounted to 35.8% of the total export value, the ten year mean being 30.1%. The leading place, in point of value, is occupied by boards and planks, accounting together for 10%, followed by cellulose and pulp absorbing 6.8%, paper (6%), plywood and articles therefrom (4.5%), pit-props (1.5%), matches (0.7%), and logs, blocks, and sleepers (0,5%).

The aggregate value of these exports reached its peak in 1928 at Ekr. 40 million, and the bottom figure, in 1932 at Ekr. 11.3 million, the ten year average (1925—34) being roundly Ekr. 26 million. This works out at Ekr. 28 per hectare of woodland, which is about 2½ times the average per hectare value of the yield of timber. It should, however, be borne in mind that only a part of the forest produce is utilised for the manufacture of export goods.

The proceeds of these exports represent, for the most part, a net national income shared by the forest economy, the transport servise and industry.

7. Silvicultural Instruction and Research Work.

Silviculture is taught at the Silvicultural Section of the Faculty of Agriculture of the Tartu University. The curriculum lasts three and a half years. Lectures on the different special branches are read by three professors forming the permanent teaching-staff of the section. Practical exercises for the students are conducted at the training and experimental station of the University. Scientific works

are published in the „Publications of the Silvicultural Section of the Tartu University", in which 26 researches have appeared up to 1936. Graduates of the Silvicultural Section are entitled to pass examinations to obtain the M. A. or doctor's degree.

Elementary instruction in forestry is given at the School of Forestry at the Voltveti forest district, where one-year courses are conducted for forest guards and two years' courses for forest rangers.

The Academic Forest Society at Tartu issues a Silvicultural Year Book and has published many text-books and hand-books on forestry. It arranges meetings of and acts as a connecting link between silviculturists. Once a year the Day of Silviculturists is held at Tartu to which outsiders taking an interest in forestry are also admitted. At these meetings discussions are conducted on questions relating to forestry, and they have become an important factor in the development of forestry in Estonia.

The Union of Forest Societies is an organisation uniting actual farmers and other persons interested in practical forestry. It conducts and organises advice on questions regarding the working of farm woods, arranges meetings, and organises informative work on forest management. As from the beginning of 1937 the Union has secured the services of eight expert instructors.

Furthermore, there are four professional organisations, viz.: the Associations of Timber Industries, Forest Appraisers, Forest Employees, and Chief Foresters. The last-named two conjointly with the Union of Forest Societies and the Academic Forest Society are issuing a monthly bulletin „Eesti Mets" („The Estonian Forest"). Lastly there is the Association of Fellows of the Voltveti School of Forestry.

Under the Forest Law in operation an Institute for Silvicultural Research was opened in 1937. The Institute is operating at the Tartu University, although the emoluments of the manager and one assistant manager are paid by the Ministry of Agriculture. The Institute conducts researches and experimental work primarily in the experimental forest districts (of which there are four since 1931) controlled by the Administration of State Forests.

Before the establishment of the Institute numerous scientific works on forestry were published in Estonia, a considerable part of which were issued in connection with the educational work of the University and were published either in the publications of the Silvicultural Section of the latter or in the year-books edited by the Academic Forest Society. Silvicultural research work is also being done by the latter Society as well as by the Administration of State Forests.

8. Forestry and Economic Policy.

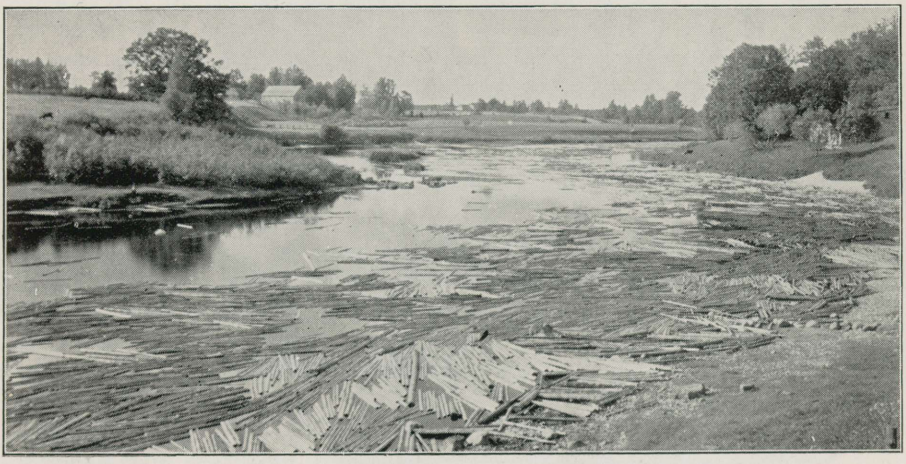
Since the establishment of the Republic the following five more important railway lines have been constructed, viz.: Riiselja-Ikla, Sonda-Mustvee, Lelle-Papiniidu, Tartu-Petseri, and Rapla-Virtsu. The first two lines have been constructed mainly with the object of facilitating the transportation of timber. In fact, timber prices in those localities have risen considerably, and it has become possible to send to the market the entire produce of the forests. For the conveyance of firewood to the railway lines ground-railways have been constructed in several places. The roads also have been materially improved, and the highways of the first category are now fit for motor traffic throughout the year.

As a result, the removal of timber from remote places, formerly unprofitable, has become a paying proposition.

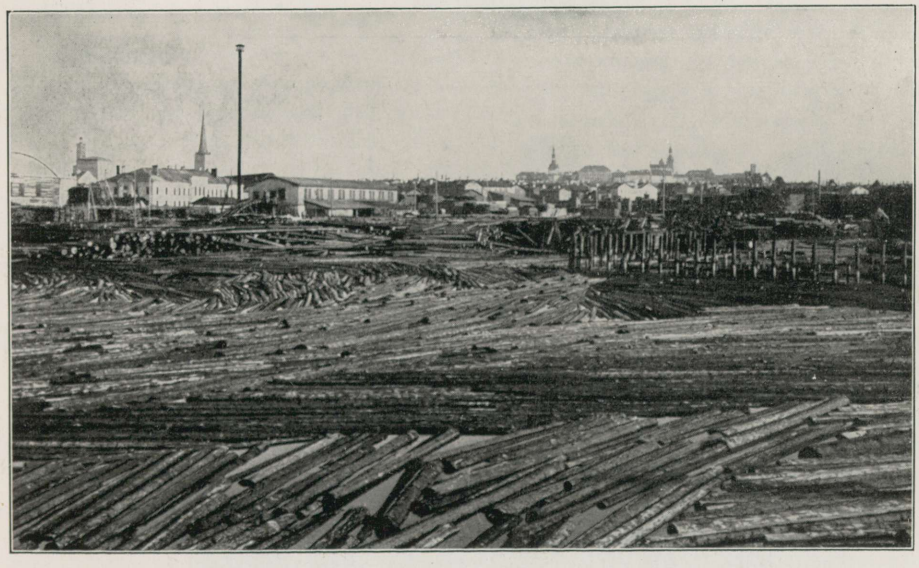
In the early years after the World War exports of timber, both worked and in a raw state, were subject to export duty. During the years 1927—1931 the duty on many descriptions was abolished and on several others it was reduced.

Imports of timber raw materials have always been free of duty, while on manufactured wood-goods a small import duty is charged in order to protect the local industries.

Floating on river Narva.



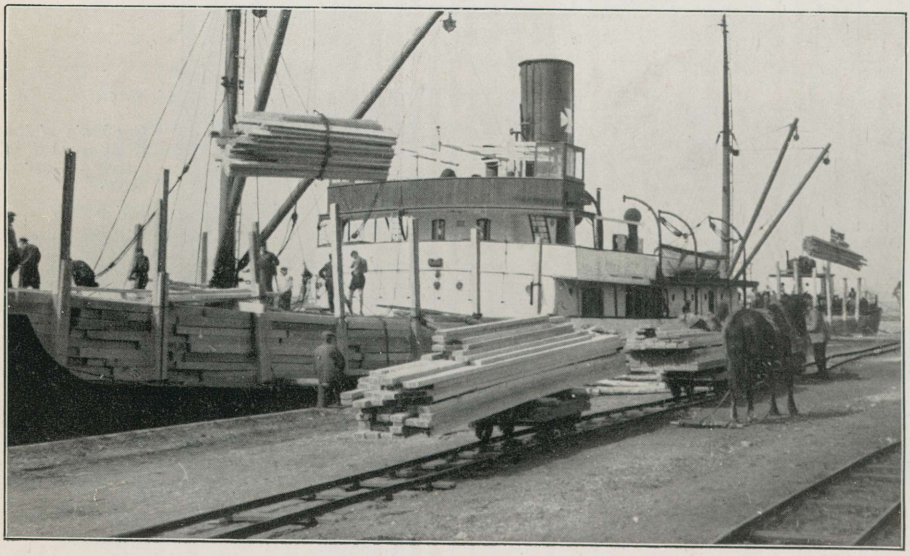
Floating on river Pärnu.



Log basin at the Tallinn sawmill of the State Timber Industry.

Removal of timber materials on sleighs. Jõhvi forest district.

Conveyance of timber materials to the railway station by motor-lorries. Purila forest district.



Loading of boards, State Timber Industry.

Only a small portion of the timber produce of the State forests is sold on a purely business basis (by auction). The greater part is sold to the local population at retail prices which are lower than the wholesale prices paid by manufacturers. Timber is sold at retail prices mostly to the population outside the administrative confines of towns and boroughs. This is done with a view to supporting agriculture, fishery, inland and coastal shipping, and preventing to some extent a rise in the cost of living. The loss arising to the Treasury on these operations is considerable, the difference between the market quotations and the actual sales prices alone on timber sold to new settlers in 1921—1930 exceeding Ekr. 9 million, which is 15.3% of the total income of the Administration for this period or rouhgly one-half of the total expenses in connection with the management of the State forests over the same period. An approximately equal loss has been sustained in connection with the appraisal at privileged rates of the standing timber on land distributed to settlers. There are certain other privileges of smaller consequence. With the coming into force of the new Forest Law (1934) a part of the abovementioned privileges and facilities have been abolished, but the retail sale of wood to local inhabitants at rates below the wholesale market price still continues.

The taxation of landed property in Estonia is based on the returns, or the net profit, derived therefrom. All lands have been divided into productivity or quality classes in accordance with their assessed productive capacity. The productiveness of lands within a given quality class is assessed differently, taking into consideration peculiar local conditions.

The tariffs for the assessment of landed property have been fixed separately for each category of the quality class it belongs to. For pine and spruce forests five productivity classes have been established on the basis of Vargas de Bedemar's tables. For the valuation of broad-leaved timber land only three classes exist. Spruce forests on better soils are considered more productive than pine forests, and vice versa, while broad-leaved timber is classed lower than coniferous timber.

From the standpoint of the landowner's interests it is by no means irrelevant whether his land is classed and taxed as pasture, woodland or tillage-ground. If classified under the first-mentioned description, the tax burden is usually least onerous. Inferior arable grounds are as a rule less heavily taxed than if classified as woodland. Frequently arable soils of the VII and VIII classes are capable to produce woods of the I and II qualities. Investigations carried out by the Ministry of Agriculture for the revision of tax rates on landed estate have shown that corn cultivation on tillage-soils of the VII and VIII classes does not pay, and if utilised as field, the land yields no net return at all.

The general conclusion to be drawn from the abovesaid is that the existing system of taxation of landed property is not apt to encourage forest cultivation, as it is rather conducive to the conversion of woodland into pasture land of low productivity. The domestic market prices of wood are no doubt to some extent influenced by the tax burden imposed on the timber industry.

Prior to independence the private landed property in Estonia was extremely unjustly distributed. To provide land for the landless rural classes in the early days of the Republic the big landed estates were expropriated against a reasonable compensation and were destined for parcellation and settlement.

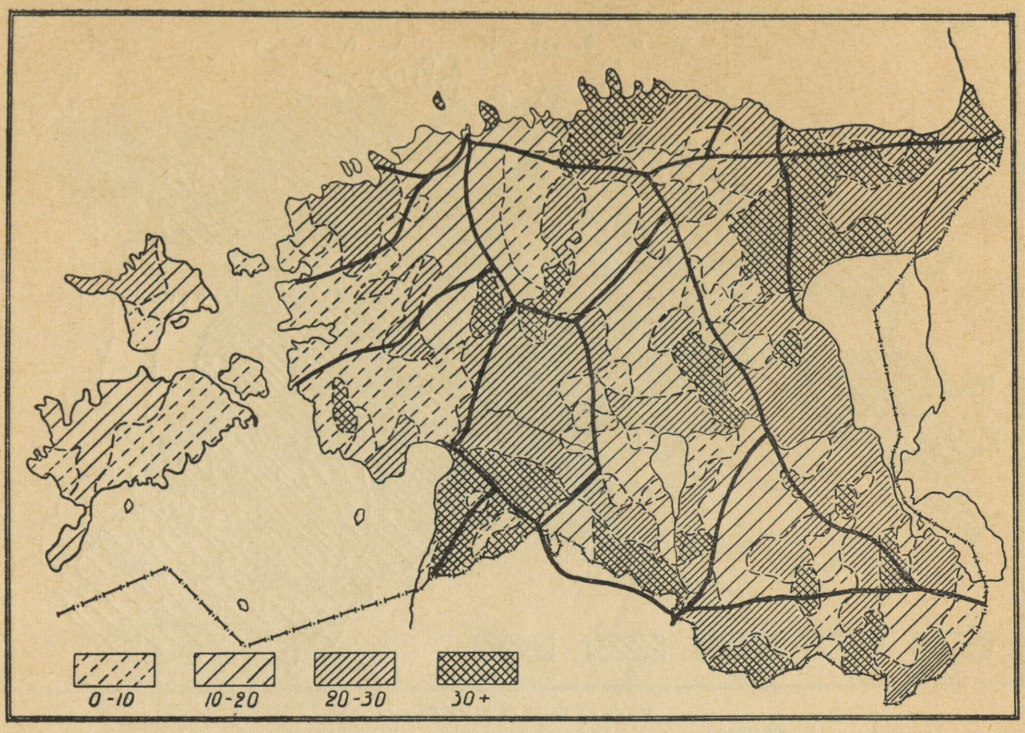
The Agrarian Law, upon which the land reform is based, provided in its original form for the forests situated on the great landed properties to be nationalised. Later on, however, this provision was amended, and large lots of woodland have since been parcelled for creating settlements. Up to 1935 as much as 109,063 hectares of woodland or 15.7% of the whole area under State forests had been distributed for this purpose. In general, more

woodland has been given to settlers in thinly timbered regions than in areas richly clothed with wood.

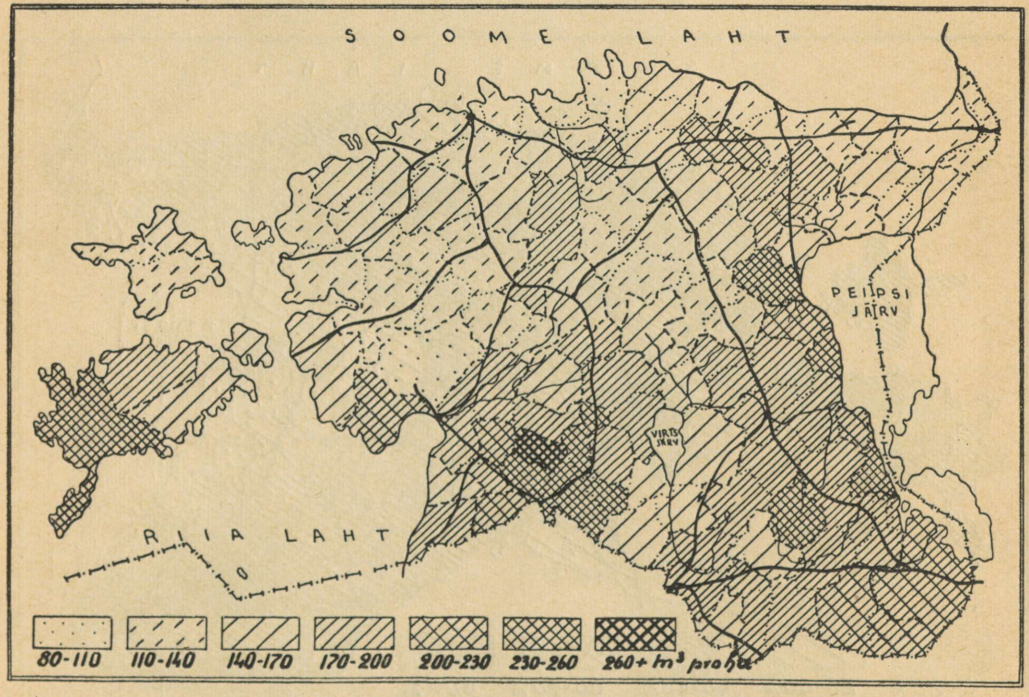
Under the Forest Law, which came into force in 1934, authority to decide on questions of settlements on the State forest area was withdrawn from the competency of the Minister of Agriculture and vested in the Government, in connection with which the settlement of State woodland has been reduced. The Forest Law empowers the authorities to supervise the management of forests in private ownership also. In private forests of not less than 30 hectares it is prohibited without special permission to convert woodland into any other description of land and to cut timber beyond the natural increment. All private forests of an area exceeding 50 hectares must be managed under working plans. The supervision of private forests is carried out by the Forest Preservation Committe organised at the Administration of State Forests. The Committee examines questions, and makes decisions, in connection with the settlement of State forest areas.

In September 1936 the Government approved the fundamental principles to be laid down in a five year plan for the management of forests. Under the scheme, greater attention is to be paid to the preservation of the country's forest resources.

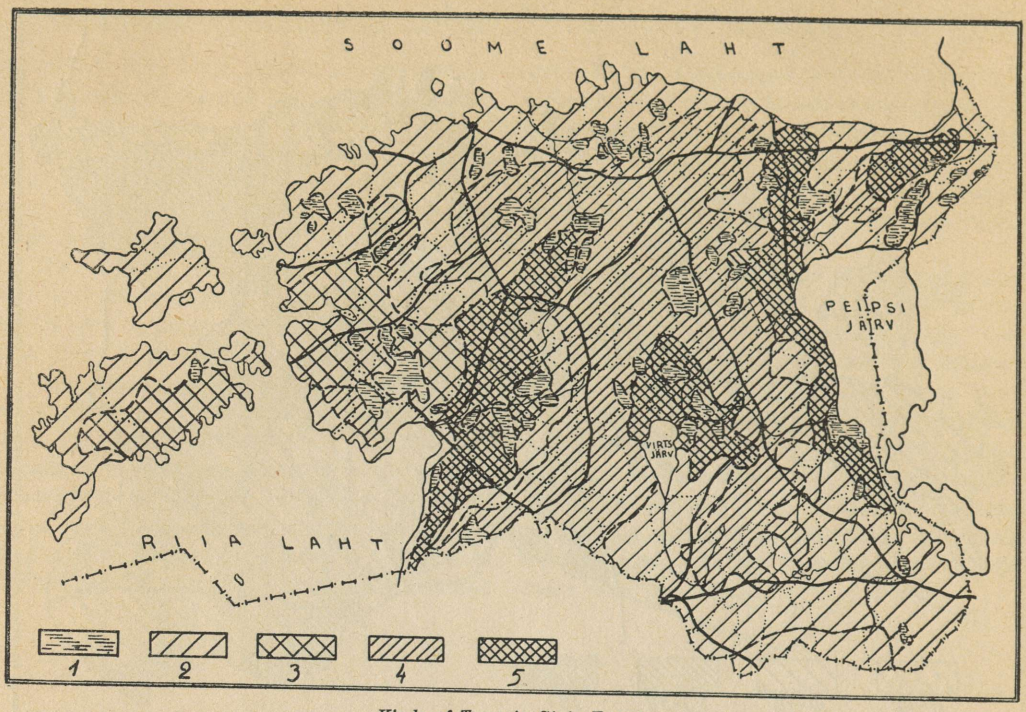
Although in the past years much timber has had to be cut in connection with widespread settling activities, the forest resources of Estonia are still comparatively plentiful, and the prospects for their further development are favourable.



Per Cent of Forest Land of Total Area of Communes.

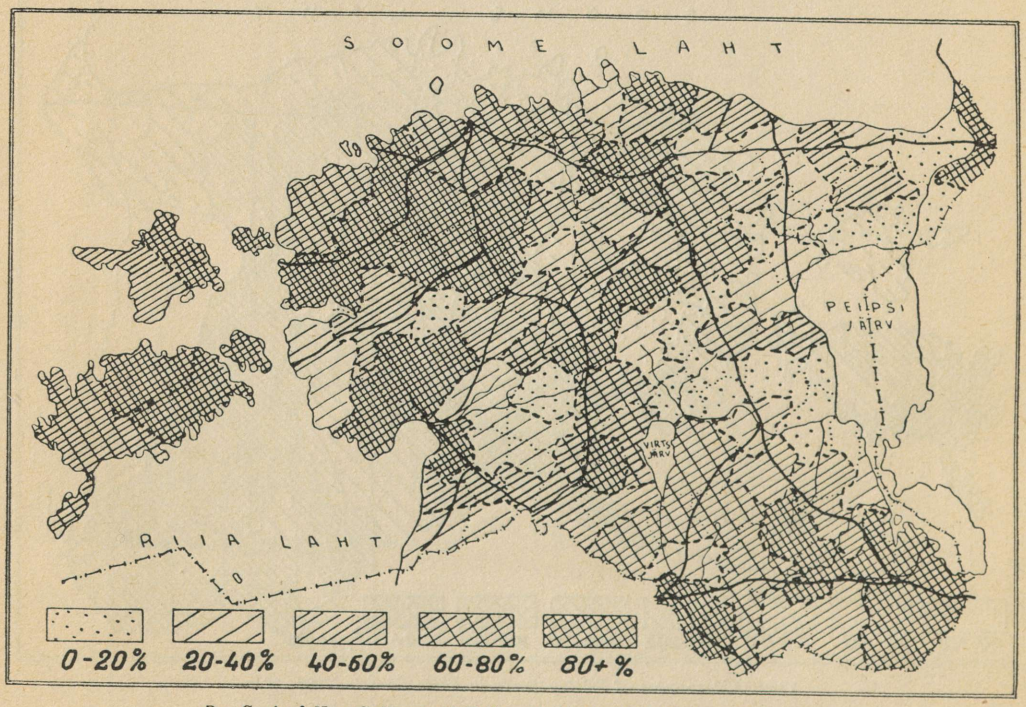


Timber Resourses of Felling Beats in State Forests (1922—26).



Kinds of Trees in State Forests.

1. *Swamps.*
2. *Areas with Pine Forests Dominating.*
3. *Pine Forest Areas with Broad-leaved Trees Dominating.*
4. *Areas with Spruce Forests Dominating.*
5. *Spruce-Mixed Forest Areas with Broad-leaved Trees Dominating.*



Per Cent of New Cultures of Felling Beats in State Forests (1931—33).