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FOREST-BASED INDUSTRIES IN FINLAND^{1/}

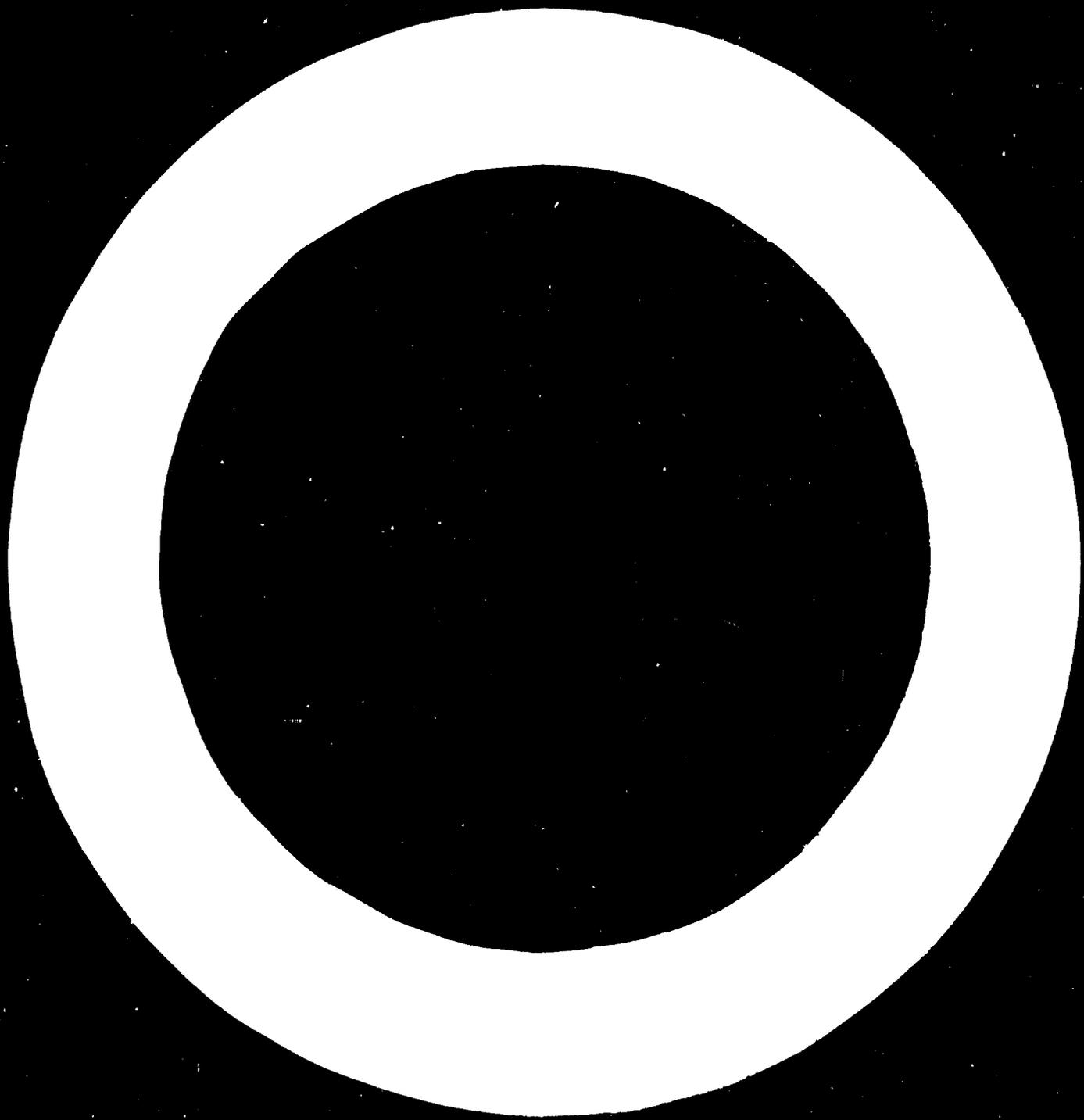
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FOREST-BASED INDUSTRIES IN FINLAND

A GENERAL REVIEW

The start of the forest-based industries in Finland dates back to the middle of the nineteenth century. At that time and during the next years the sawmilling industry contributed the bulk of the quantity and value of the production of forest-based products as well as of their exports. The production of pulp and paper mills was rather modest, being at the turn of the century some 50 000 tons pulp and approx. equal amounts of paper and board. Since then the development has progressed very rapidly and only wars and international recessions have caused interruptions or decreases in production. This rapid development can be described with the help of production figures:

	Sawnwood	Pulp	Paper
1920	2.6 mill. m ³	0.3 mill. t	.2 mill. t
1930	4.5	0.9	.4
1950	4.8	1.8	.8
1960	6.7	3.5	1.9
1970	7.3	6.2 n	3.0

In the course of development the structure of production has changed considerably. Pulp and paper have the dominant position and the present trend aims vigorously toward a higher degree of final processing. It is worthy to mention that also plywood and fibreboard mills, as well as particle board mills, constitute at present a significant sector in the forest-based industry, particularly in forest industry integrates.

2.

The structure and production of Finland's forest-based industries in 1970 are described in Table 1.

Table 1. Forest Industry in Finland in 1970

Branch of Industry	Number of prod. plants	Production	
		Total	Average per plant 1000 units
Sawmills	..	7,300 m ³	..
Plywood and veneer mills	30	706 "	24 m ³
Particle board mills	9	380 "	42 "
Fibre board mills	7	241 t	34 t
Mechanical pulp mills	22	1,711 "	78 "
Semi-chemical pulp mills	7	324 "	46 "
Sulphite mills	17	1,461 "	86 "
Sulphate mills	16	2,726 "	170 "
Paper mills	29	3,033 "	105 "
Paperboard mills	16	1,225 "	77 "

Together with the expanded capacity the average size of mills has increased considerably and at present the Finnish pulp and paper mills are bigger than the corresponding ones in other Scandinavian countries. Another feature which has its economical significance, is the relatively high level of integration in Finnish forest industry.

The consumption of wooden raw materials has increased particularly during the last 15 years as can be seen from figures presented in Table 2.

Table 2. Consumption of Industrial Wood in 1955-1969

Branch of industry	mill. m ³			
	1955	1960	1965	1969
Sawmilling	10.9	13.8	13.9	12.9
Plywood	1.2	1.0	1.5	1.7
Particle board	-	.2	.3	.5
Fibre board	.5	.6	.7	.6
Pulp	10.8	14.0	31.1	23.8
Total	23.4	29.6	37.5	39.5

The total industrial wood consumption has increased by 70 % the bulk of which is concentrated in the pulp industry. In sawmilling the production reached its peak in the first half of the sixties and is now somewhat below that level. As to other industries, the rapid development of particle board industry should be noted, particularly as it is still accelerating. A new big (240 000m³) mill has had its start-up this year and at least four new mills will be erected within the next few years.

Notwithstanding the rapid extension of particle board industries in the sixties the bulk of the growth was in pulp industry. The vertical integration advanced rapidly in the pulp and paper industry and the most intense capacity expansion in the paper industry was apparent in bulk products such as newsprint, magazine paper, kraft paper and liner and fluting. Two products which have become more prominent during the last few years are tissue and wood-containing magazine papers.

The dearth of wood is the main reason why the industry is concentrating on the upgrading of production. This goes for the pulp and paper as well as for the mechanical wood industry. Particularly in wood-based panel industries the share of various laminated panels has increased sizably, and the furniture and joinery industries have also developed substantially.

The plywood mills have often been the origin of a forest industry integrate. Considerable quantities of veneer residues have offered a suitable raw

material source for particle board, fibreboard and pulp industries. In the sawmilling industry, integration benefits have given impetus to joinery industry, and lately a few furniture factories have wanted to secure their raw material supply through the acquisition of sawmills.

The long-term stability and growth potential of Finland's forest industries is established in a great measure on the development of the forests, the most important natural resource in Finland. Two thirds of the total land area is classified as forested and the total growing stock is some 1450 million cu.m.

However, in spite of these rather impressive figures we have now reached a situation, where wood scarcity is the most limiting factor in the expansion of the forest-based industries. The total drain in 1970 is estimated to be 50.6 mill. cu.m., whilst the annual increment is 47.6 mill. cu.m. and the allowable cut 50.5 mill. cu.m.

In the early sixties the situation was more unbalanced, but with the help of very intensive silvicultural and forest improvement activities, such as re-forestation, drainage and fertilization, the forest balance since that time has improved in spite of vigorous capacity expansion of forest industries. There are also other factors which have affected this development, e.g. the use of fuel wood has decreased and the waste wood from sawmills and plywood mills has been utilized more effectively. The waste wood includes also sawdust which is being used as a raw material in several particle board, refinery groundwood and sulphate pulp mills. Some ten years ago Finland exported considerable quantities of roundwood but at present the situation is completely reversed. Finland is a net importer of roundwood.

Several long-term forest policy programs have been prepared aiming to increase the wood supply. In case these programs can be achieved the annual allowable cut will rise to 50 million m³ by 1980 and 80 million m³ by 2015. So far the targets set for various forest improvement activities have not been fully achieved, mainly for financial reasons.

Since it has commonly been agreed that the primary forest industry can be enlarged only within the limits permitted by the stability of wood output, several capacity expansion plans have been shelved in anticipation of the fulfilment of the targets of primary forest improvement work. Whether or not the projected figures of wood supply will be reached completely, it seems clear that satisfactory long-term expansion of Finland's basic forest industry is assured.

2. THE FOREST INDUSTRY'S ROLE IN FINLAND'S ECONOMIC LIFE

In Finland the market economy has actually developed during the last 100 years. The start derives from the vigorous development of sawmilling industry. Although the road connections were rather deficient, the regional impact of this industrial activity was extensive. This was due to the existence of plenty of natural waterways suitable for floating sawlogs. The transformation to a market economy eventuated rapidly, sawmilling industry being in a key position in this development.

The forest industry was a special advantage in the industrialization process: the effects are not limited only to a few locations, but they extend widely through logging and transportation operations. The formation of isolated blocs, as may take place in the mining industry will be eliminated. Since the First World War until the late fifties the pulp and paper industry was the most prominent sector in industrialization. In several cases its maintenance workshops have grown into big engineering works. After the Second World War these two branches of industry accounted for the industrial development which transformed Finland from a semi-industrial country into an industrial country in the late fifties.

The position and significance of the forest industry in Finland's economy can be reviewed with the help of statistical background information.

The growth rate of the total output of the Finnish economy since 1950 may be deemed satisfactory.

Table 3. Gross National Product (SNA) at Factor Cost (1970 US\$)

	Total US\$ 1000 mill.	Industry		of which	
		Wood	Pulp and Paper	%	Forestry
1950	2.9	-	-		10
1960	5.2	-	-		9
1965	6.8	2	4		9
1970	9.1	2	5		7

The gross national product increased by an average of 5 % a year from 1950 to 1970. The growth achieved was mainly based upon a rapid expansion of imports and exports as well as upon private investment. As a natural consequence of industrialization the proportion of primary production, forestry, of the gross domestic product has decreased steadily. The income per capita was US\$ 1700 in 1970.

The labor force in the whole industry was 370 000 in 1969, of which the forest industry accounted for 18 % (Wood 8, pulp and paper 10 %). The total labor force in agriculture and forestry was 486 000 in 1970. Through rationalization the labor force has been reduced in the forest industry where feasible and the value of production per employee has risen by 7-9 % per year on the average.

The gross value of production by various branches of industry is presented below.

Table 4. Gross Value of Production by Industries

	Whole ind. US\$ 1000 mill.	of which %			
		Wood	Pulp and Paper	Chemical	Engineering
1960	3.0	8	16	4	21
1965	4.6	7	18	5	21
1969	7.3	6	17	4	23

The value added of the gross value of production was 31 % in the mechanical forest, 23% in the pulp and paper and 42% in the engineering industry. The wages account for 20, 12 and 28 %, respectively.

The forest-based industries have a particular significance in the economy of Finland's developing regions. In the northern and eastern parts of the country the forest industry accounts for almost 40 % of the gross value of industrial production and some 30 % of the labor force employed by industry. In addition to this it must be underlined that the bulk of forests are situated in these developing regions and that a lot of people are employed by various work in forestry, such as logging, timber transportation and silvicultural works.

The forest industries contribution to the industrial production expressed as gross value of production is 20-25 %. This already indicates its central position in Finland's economy, which distinctively can be seen in the exports statistics.

Table 5. Exports

	Total US\$ mill.	of which %			Total
		Forestry	Wood	Pulp and Paper	
1960	760	6	27	42	75
1965	1100	1	20	47	68
1970	2300	1	16	39	56

The structure of the exports of forest industry products is presented in the following table.

Table 6. Exports of Forest Industry Products 1970

Product	Exports	Percentage of total production
Sawnwood	4.7 mill. m ³	64
Plywood	.6 "	86
Particle board	.2 "	44
Fibre board	.2 mill. tons	63
Groundwood pulp	.0 " "	3
Chemical pulp	2.0 " "	48
Paper and paperboard	3.5 " "	82

Due to the present and projected expansions (8 new paper or paperboard machines have their start-up during this or the next year) the exports of paper and paperboard products will increase, with correspondingly diminishing pulp exports. Particle board exports will be increasing as well as those of all secondary forest products, in the first place converted paper and paperboard and furniture products.

The Finnish forest industry products are exported all over the world. However, Western Europe constitutes by far the most important market area accounting for more than 70 % (1970) of the exports. Eastern Europe takes some 10-12 % and the remaining 15-20 % goes overseas.

The exports of forest industry products earn lot of foreign exchange for Finland. These deliveries are all the more important since they comprise only a small portion of imported goods (oil, chemicals, kaolin, etc.). In forest industries imported raw materials constituted only 8 % of the total value of raw material consumption in 1967, thus yielding a net surplus of US\$ 720 mill. in Finland's balance of payments. This figure does not include the imports of investment goods. Our company has recently calculated that in a few potential newsprint mills in the South-West Asia the import content varies between 40 and 60 % (excl. capital costs).

Since at present the wood supply imposes limits on the expansion of new primary forest industry, it is very interesting to calculate the foreign exchange earnings per unit of raw material for various forest industry products.

Table 7. Foreign Exchange Earnings in US\$ per Cubic Meter of Roundwood Consumed

Product	1 FOB Price US\$/unit	2 Wood consumpt. m ³ /unit	1/2 US\$/m ³
MF-newsprint	130	3.0	44
SC-magazine paper	145	2.7	53
LWC-paper	180	2.7	66
Kraft paper	175	5.0	35
Woodfree fine paper	260	4.4	60
Fluting	95	2.5	38
Kraftliner	125	4.3	29
Unbleached sulphate	140	4.8	29
Bleached "	165	5.2	32
Unbleached sulphite	145	4.7	31
Bleached "	165	5.3	31
Groundwood pulp	75	2.4	32
Pine sawnwood	50	1.85(gross)	25
"	50	1.35 ¹⁾	37
"	50	1.10 ²⁾	45
Birch plywood	190	3.0 (gross)	64
"	190	1.55 ³⁾	121
Particle board	55	1.5	38
Construction plywood	120	2.7(gross)	44
Construction plywood	120	1.55 ⁴⁾	77
Tissue paper	430	5.2	83
Flush door	4	0.5 (gross)	81
"	4	0.3 ⁵⁾	135
" (painted)	7	0.5 (gross)	135
"	7	0.3 ⁵⁾	225

1) 1.85-chips 0.50

2) 1.35-sawdust 0.25

3) 3.0-chips 1.45

4) 2.7-chips 1.15

5) 0.5-chips and sawdust 0.2

The analysis shows that exchange earnings per consumed roundwood unit generally increase as the grade of processing rises. However, it should be noted that some grades require considerable quantities of imported additives, which impairs their position in this comparison. This drive towards upgrading production is apparent also from export statistics.

Besides the products of the joinery industry (flush doors) birch plywood gives the highest return in terms of national economics. This is very interesting since at present birch veneer logs are so scarce that several plywood mills are compelled, at least partly, to switch over to the use of spruce as their raw material.

Pulp and paper is a highly capital-intensive industry rivaled only by the chemical industry. The investments for new capacity have been considerable in Finnish circumstances, particularly since 1967, when the Finnish mark was devaluated. Total investments of forest industry expressed as acquisition of fixed capital were some 100 mill. US\$ per year (in 1965-66 and 120-140 mill. US\$ in 1968-69. A preliminary estimate for the years 1970-71 stands at some 140 mill US\$. These figures represent 20-25% of the all industrial investments. For comparison it can be stated that the investment requirements for carrying out the MERA long-term forest policy program are some US\$ 75 mill. annually.

The capital intensity of the forest industry can be seen also in Table 8 which shows the investments per employee (excl. administration) and per unit of raw material in a few of the forest industry sectors. The cases described represent big modern production units in Scandinavian circumstances. The contrasts between the cases emerge clearly from this comparison.

Table 8. Investments per Employee (excl. administration) and Unit of Raw Material in Selected Cases

Mill	Capacity	Investment US\$ mill.	Employees	Inv./Empl. US\$ 1000	Inv./m ³ US\$
Bl. sulphate pulp	270 000 t/y	95	330	280	65
Newsprint	140 000 t/y	48	190	250	115
Tissue paper	32 000 t/y	16	190	85	120
Sawmill	200 000 m ³ /y	17	143	115	45

The other positions created indirectly by the new forest industry, such as in logging, transportation, commerce and services, usually account for the greater part of total employment.

According to the above table, a vacancy in sawmilling industry costs over US\$ 100 000. This seems rather high compared with pulp and paper mills, but it can be explained by the high degree of mechanization and instrumentation of the entire mill. If we take a standard type of existing sawmill, say with a capacity of 70 000 m³/year, the investment per employee is only half of that of a modern one, US\$ 60 000. Furthermore, it should be noted that the small sawmills, e.g. circular saws, need considerably less investments per employee.

3. FUTURE TRENDS AND PROSPECTS

The scarcity of wood raw material imposes limits for expansion of primary forest industries. However, by various means it will be possible to increase the wood supply. The following ones seem to be most promising:

- carrying out the MERA program according to plan
- changing the wood consumption structure, particularly by decreasing the use of fuel wood in the countryside
- using wastewood, particularly sawdust, still more accurately
- starting to use felling waste, branches and stumps as raw material in the pulp industry.

However, in spite of these endeavours to increase wood supply, in the short run it does not seem feasible to establish new units of primary forest industries. The potential new production capacity should be confined to the expansion of existing mills. The industrial optimum calls for big, integrated production unit where the utilization of various factors affecting the economic result, such as capital, labor, power and residues is optimized. Some structural changes will be needed. It does not pay to rebuild old small units but it is more sensible to aim for new integrated industry with due consideration to a proper product mix.

Another very essential goal is to intensify the vertical integration of the forest industry by upgrading the production and thus to conserve the forest industry products as number one in Finland's exports. It is of vital interest for Finland that satisfactory agreements can be negotiated with Europe's trade associations. At present Finland is an associated member of EFTA and in case the UK will become a member of EEC a decisive question will be how Finland's trade relations can be arranged.

Although we are scarce of forest resources, we have technical know-how and world-wide trade organizations. This has led to international investments in Europe and North America. So far Finland has not made any notable investments in the developing countries, but as the fibre deficit in Europe is

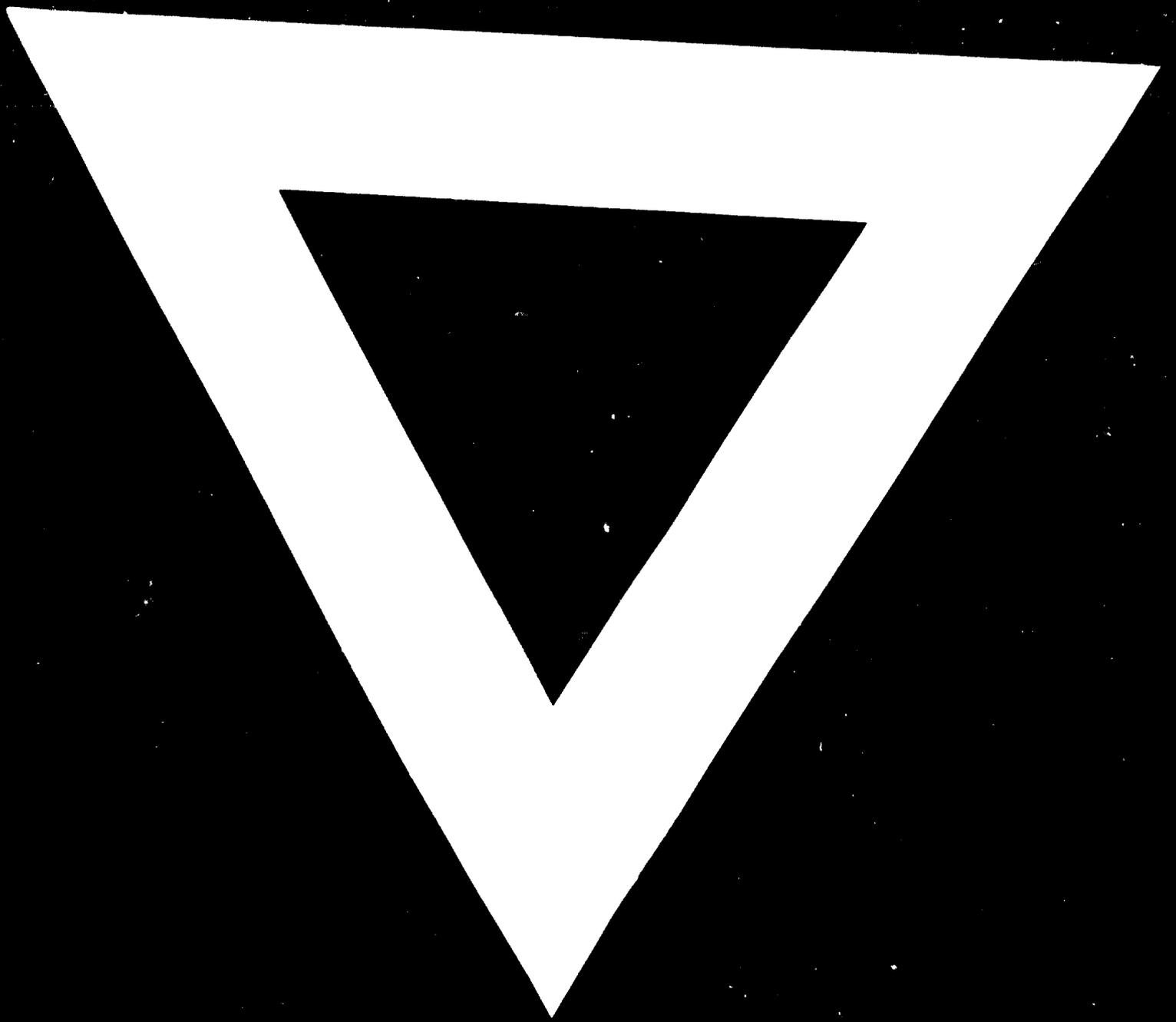
widening, Finland's interest in various forms of economic co-operation in this sector will be ascending.

The premises Finland has at its disposal are the world-wide market organizations, competent management, quite comprehensive university training of engineers and foresters and large-scale engineering industry which is specialized in machines for the forest industries.

Another alternative of a Finnish forest industry enterprise is the diversification of production. So far the most important branches have been engineering industry, chemical industry, particularly for producing chemicals for needs of the forest industry and shipping. It seems that these sectors will be even more emphasized in the future.

14.

	Coniferous sawwood 1000 std	Plywood 1000 m ³	Wood pulp total 1000 tons	Paper and board total 1000 tons
P r o d u c t i o n				
Whole world	64 489	28 061	90 409	112 309
Europe	12 420	3 565	24 760	34 019
Finland	1 245	615	5 950	3 629
Finland's share				
of global production	1.93%	2.19%	6.58%	3.23%
of European production	10.02%	17.25%	24.03%	10.67%
E x p o r t s				
Whole world	10 163	3 745	15 013	19 946
Europe	3 866	1 032	7 730	9 124
Finland	813	540	2 224	3 041
Finland's share				
of global exports	8.00%	14.42%	14.81%	15.25%
of European exports	21.03%	52.33%	28.77%	33.33%



10.8.73