The Uses of Industrial Softwood in Britain

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Introduction

Industrial softwood is defined for the purposes of this paper as coniferous sawnwood. Britain obtains sawnwood, either by imports or by its own coniferous resource. Imports predominate, and although the level of imports has fallen in recent years from an average of some 8.5 million m^3 in the early 1970's to some 6.5 million m^3 since the economic recession following the rise in oil price in 1973/74, nevertheless the home resource contributes less than 8 percent of the demand. At the same time the level of supply of British conifers is expected to rise dramatically within the next twenty five years, reaching double the present level within the next fifteen years. The effective utilisation of this resource presents a challenge to British sawmillers, to meet competition from imports and to maintain the advantage given by sawmill sized logs, under terms of increasing competition from other wood using industries, notably pulping.

A number of approaches are open in presenting a review of the present situation. I have chosen first to review the nature and development of the British resource, second to review the structure of the sawmilling industry in Britain, third to examine the end users of all industrial softwood in Britain and quantify the present market place and future potential for British softwoods, and finally to examine the market structure for industrial softwoods in order to identify the technological and institutional characteristics which the British sector must meet to be commercially competitive with imports.

The Nature of the British Resource

At the present time almost 2.0 million ha. of land in Britain carries a forest cover, 80 percent of which is high forest, almost equally shared by the Forestry Commission and private ownership, (1)*. Three-quarters of the high forest carries conifers, and of this over 60 percent is State owned. Seventy percent of the conifer resource has been planted since 1950, and although the age class distribution is not normal, being conditioned more by the availability of land for planting than the dictates of classical management — a rapid expansion of production can be expected within a relatively short space of time.

In terms of species distribution, 41 percent of the conifer resource is Norway and Sitka spruce; 36 percent is in pine and 23 percent is in a variety of other softwood species dominated by larch and Douglas fir.

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* Numbers in parentheses indicate bibliographic citation.

The production forecasts from the conifer resource are shown in Table 1. The historical data from 1972 until 1976 are of interest since they represent the platform for future development, illustrating a steady annual increase in the potential supply which will rapidly escalate to the turn of the century. At this point it is useful to indicate that under British conditions the supply of softwood is not immune from international competition. Whereas in 1972 almost all, 98 percent, of the supply was actually taken up by the wood using industries, by 1976 — in the face of a falling market for wood products — the uptake fell to only 75 percent of the resource availability. The private sector in fact sold only 67 percent of its available resource in 1976, as opposed to 95 percent in 1972.

TABLE 1
Production Forecasts for Conifer Resource in Britain 1972-20000
units × 1000 m^3 roundwood)

	1972	1973	1974	1975	1976	1980	1985	1990	2000
England	857	993	1,020	1,058	1,097	1,410	1,690	2,060	2,610
Scotland	1,165	1137	1,201	1,218	1,314	1,460	1,790	2,340	2,880
Wales	343	352	362	424	409	560	730	970	1,310
Britain	2,383	2482	2,583	2,700	2,802	3,430	4,210	5,370	6,800

Source: Forestry Commission various.

Table 1 shows that if the full resource potential is to be realised markets outlets will need to be found for an additional 4.0 million m^3 of coniferous timber by the turn of the century.

Only part of this resource will be available as sawlogs. Using the conventional dividing line between small wood and sawlogs — 15 cm d.b.h.o.b. Table 2 divides the availability of coniferous woods using the production forecasts from 1975 to the year 2000. In fact the proportion of sawlogs remains remarkably consistent over this period, at between 58 and 60 percent. Throughout the period both State and Private enterprise will supply the logs, but the distribution will vary, State resources supplied 64 percent in 1975 and are expected to supply 72 percent in the year 2000.

Table 2 shows that during the next 25 years an additional 2.2 million m^3 of sawlogs will become available, of these 860 thousand m^3 will be produced in England; 820 thousand m^3 in Scotland and 550 thousand m^3 in Wales.

The conclusion on the resource situation is clear. The stage is set for a steady escalation in the supply of both small wood and sawlogs from the conifer resource up to the turn of the century. Thereafter the position is not so clearly defined although the prognostications are for a continuing if not escalating supply of raw material.

TABLE 2
Production Forecasts for Smallwood and Sawlogs from Conifer Resource in Britain 1975-2000 (units × 1000 m³

	1975		1980		1985		1990		2000	
	Small	Logs	Small	Logs	Small	Logs	Small	Logs	Small	Logs
England	450	608	600	810	670	1,020	780	1,280	1,100	1,510
Scotland	453	765	590	870	760	1,030	1,010	1,330	1,250	1,630
Wales	178	246	240	320	300	430	370	600	510	800
Britain	1,081	1,619	1,430	2,000	1,730	2,480	2,160	3,210	2,860	3,940

Source: Forestry Commission various.

The Structure of the Sawmilling Industry

The evaluation of the softwood sawmilling industry based on British timber is made mainly from information available through the Home Timber Merchants Asscoiation of England and Wales, H.T.M.A Scotland, the Forestry Commission and a study completed by the international forest industry consultants Jakko Poyry (2) in 1974.

Table 3 shows that there are 447 sawmills cutting British broadleaved and coniferous woods. They range in size from an annual log intake of 500m³ per annum to 40,000m³ per annum.

TABLE3
British Softwood and Hardwood Sawmills
Grouped According to Log Intake Capacity

Size Class	Annual Log Intake (m³/a)	Number Of Mills	Estimated Total Log Intake (1000 m³/a)	Share of Total Log Intake %	
very	500	60	45	2.0	
small	1000	39	49	2.2	11.2
	1500	42	74	3.3	
	2000	37	83	3.7	
Small	2500	45	124	5.5	
	3000	50	174	7.7	21.6
	4000	42	189	8.4	
Medium	5000	24	132	5.8	
	6000	18	117	5.2	
	7000	16	120	5.3	23.1
	8000	10	85	3.4	
	9000	8	76	3.4	
Moderate	10000	20	225	9.9	
	12500	7	96	4.2	
	15000	16	280	12.5	34.6
	20000	8	180	8.0	
	30000	2	65	2.9	
Large	40000	3	150	6.6	
					9.5

Source: Jaako Poyry (1974)

42 percent of the mills are between 500 and 2,500m³ capacity and they cut some 13 percent of the roundwood availability.

11 percent of the mills are over 10,000m³ capacity and they cut 42 percent of the roundwood availability.

In the present state of the sawmill industry it may be argued that the large proportion of small mills provides a great degree of flexibility to meet both changing local markets and to provide for diversity and scattered distribution loosely matching that of log supply. 61 percent of all mills are found in England, 32 percent in Scotland and 7 percent in Wales.

British sawmills fall into three general categories, those which cut predominantly broadleaved species-24 percent of the total and mainly located in England; those which cut both broadleaved and conifer species — 42 lercent of the total, and those which cut predominantly conifers — 34 percent of the total and mainly located in Scotland.

In Table 4 the distribution of soft wood sawmills is shown. Once again the accent is on small mills, 73 percent cut less than 5,000m³ per annum. Only 4 mills, cutting more than 25,000m³ of logs even begin to approach the size of Scandanavian mills.

TABLE 4
Regional Distribution of Softwood Sawmills in Britain According to Mill Size

	Very Small	Small	Medium	Moderate	Large	Total
England	25	8	5	5	1	44
Scotland	29	35	10	13	2	89
Wales	4	4	2	—	1	1
Britain	58	47	17	18	4	144

Source: U.C.N.W. 1978.

The Scottish mills are more numerous, 62 percent of the total, and tend to be somewhat larger than the mills in England and Wales.

The technical standards as well as the operational efficiency of the British solfwood sawmill varies greatly. It is axiomatic that no two sawmills are exactly alike. The small and very small mills use few machines, mostly of universal type such as rack bench bandsaws for log breakdown, resawing and edging. The operation is labour intensive, relying for its profitability on low overhead costs, short haulage distances for logs, and local markets for sawnwood.

The medium and moderately large mills base their operations on individual sawmill machines usually devoid of a continuous flowline of production. these are the "old style" mills with high machinery and labour costs but with high recovery rates and a wide vatiety of well

cut products. They tend to focus on the production of semi-manufactured goods such as pallet wood, fencing, boxwood, mining timbers and short-dimension stock. The mills are vulnerable to increasing labour costs and the social facilities at many of the mills are below the general standards in British industry, so that even in these days of high unemployment it is not always easy to attract labour.

There are few large capacity mills in Britain. Those which are installed, together with some at the higher end of the moderate classification more recently built, feature continous flow line production. Here the empasis is on machinery specialisation, log breakdown (single bandsaw with carriage, or double bandmill with scrag chain) resaws (slab and cant resaws with efficient in-feeds) edging (multiple circular saw edgers) and trimming, sorting and grading in green chain operations. In the larger mills transfer systems, including live rolls and turning devices are featured, and a small number use a profile chipper in the log breakdown (green mill) sector. There is also considerable emphasis on safety.

A number of features are common to almost all mills. First, five day per day — one shift per day is the predominant operating pattern. Second, there is a big variation in log dimension and shape but few mills operate a log sorting system, i.e. most mills are equipped with flexibility in mind rather than cutting efficiency. Third, logs are often received at the mill in multiple sawlog length but few mills have an efficient cross cut section, most rely on chainsaw cutting at the log deck. Fourth, many mills feature old buildings and locations where log yard and green chain facilities are difficult to expand.

Taken together these factors lead to a loss of efficiency, adversely affect profitability and make it difficult to modernise and mechanize without heavy capital investment programmes involving a high rebuilding component.

The markets for British sawnwood are heavily biased towards the lower end of the market value sector. Sawn mining timbers, pallets, stillages, packaging and low cost buildings e.g. garden sheds predominate, so that a feature of the market is its low value added. As a consequence the British industry does not feature either the quality control, further processing or presentation which are characteristic of foreign wood imports. In addition the semi-manufactured goods produced in British mills generally find local, or at the best, regional markets and attempts to market nationally are rare indeed. Sawnwood is usually sorted for subsequent remanufacture. Lumber is not graded to a nationally accepted standard, although some of the larger mills are considering machine stress grading in their programmes. Much of the production is sold unseasoned, few mills in fact have dry storage facilities. Anti-stain

preservatives are not used, although pine particularly is subject to blue stain. Recovery rates however appear to be very reasonable, but log intake — usually measured in green tonnes, is difficult to convert accurately to sawn volume measure. With this proviso, recovery appears to be between 50 and 60 percent yields tending to be highest from short logs producing short dimension stock.

The analysis of the British sawmilling industry's structure shows that although it is well suited to flexibility, local and restricted markets, and the production of semi-manufactured products, there must be doubts as to its capability of expanding to meet the expected increase in sawlog supply from the conifer resource. Such expansion must of necessity be based on fresh capital investment with particular reference to the potential market for sawn softwood in Britain.

End Uses for Sawn Softwood in Britain

Britain is the major importer of sawn softwood in Europe and one of the leading importers of wood products in the world. In 1975 imports of all timber products amounted to 30.9 million m^3 expressed as roundwood raw material equivalents and the British production was some 3 million m^3 of roundwood, almost 10 percent of the total requirement. Estimates of consumption in the year 2000 vary, but the the most conservative of estimates from E.C.E. data indicate a consumption of 75 million m^3 roundwood raw material equivalent of which 8 million m^3 might be expected to be produced in Britain. Coniferous species will dominate this production, and the forecasts (Tables 1 and 2) show that of the 7 million m^3 expected almost 4 million will be of sawlog size. Even so the market for sawn softwood will continue to be dominated by imported raw material.

Table 5 shows the level of imports of sawn softwood since 1950 and details the imports since 1973, (3). Overall consumption has fallen since this date, a direct reflection of the general economic

TABLE 5
Imports of Sawn Softwood into Britain (units × 1000 m^3 sawn)

Yearly period	Volume	Major Imports from (units, Percentage) Sweden, Finland, Canada, Russia			
1950-1959	6.351				
1960-1969	8.318				
1970-1972	8.538				
1973	9.815				
1974	8.529	29.7	18.6	11.8	22.4
1975	5.215	24.4	16.3	19.0	22.7
1976	7.181	23.0	16.9	21.8	20.5
1977	6.426				
1973-1977	7.433				

Source: T.T.F. U.K. Yearbook of Timber Statistics 1976.
T.T.J. Feb., 1978.

climate, to which wood products are not immune, and sawn softwoods because of their reliance on the construction industry are particularly sensitive. Table 5 shows that in the five year period 1973 to 1977 the average annual consumption was 7.433 million m^3. During this period the Department of Forestry and Wood Science in Bangor carried out a series of end use analyses for industrial softwood consumption. The results, applied to the 1973-1977 annual average consumption as shown in Table 6; Predominant in this end use pattern is the dependence of consumption on the construction industry. Table 6 also shows the pattern of consumption in the British sawnwood sector which reached a production level of 670 thousand m^3 in 1975. In this sector the predominance of low value added products, fencing and garden sheds, packaging — incliding pallets, and mining timbers is emphasised. Finally Table 6 shows the pattern of consumption which can be expected of the British sawnwood resources if the same percentage end use is postulated to 1990 and 2000, total figures based on a 58 percent recovery from roundwood — a level reached in 1975.

There is clear evidence from Table 6 that the future development of the British sawmill industry will depend upon its ability to expand the market distribution into higher value added sectors. A closer examination of the present market distribution is salutory.

TABLE 6
End Use Patterns for Imported and British Conifer Sawnwood
(units of volume × 1000 m^3)

	British Sawnwood				Imported Sawnwood	
End Use	Percent		Year		Percent	period
		1975	1990	200		1973-77
Construction	9	60	167	207	67	4980
Fencing/Garden Sheds	25	170	465	575	8	595
Packaging/Pallets	31	210	577	713	12	892
Mining	30	200	558	690	2	149
Miscellaneous	5	30	93	115	*11	817
	100	670	1860**	2300**	100	7433

Notes
* Contains identified en use components of Furniture 297,000m^3 (4.0%) and D.I.Y., 223,000m^3 (3%)
** Assume 58 percent recovery from roundowws sawlog volumes quoted in Table 2.
Source: Imported Softwood. T.T.TF. (1977).
British Softwood and End Use Distributions, U.C.N.W., 1974, 1978.

Mining Timber

The demand for sawn mining timber is not expected to increase. Mechanisation and the use of hydraulic roof supports restricts sawn timber use to cover boards and chocks which are competitively

produced from low grade broadleaved species. By the turn of the century there is no doubt that the sawn mining requirement will fall quite dramatically from the 1975 level of 350 thousand m^3 from the sawnwood resource. From this fact alone there will be a need to find markets elsewhere for a substantial volume, perhaps some 200 thousand m^3 of sawnwood by 1990. Fencing sheds and packaging represent together 56 percent of the British sawn softwood market.

Their major competitor is boxwood from Portugal, as well as the lowest commercial grades from Scandanavia and Russia. These sources and grades, particularly grades, are not expected to dry up during the forecast period. Although expansion in the market place might be anticipated the consencus of opinion among British sawmillers is that price competition may well erode their market presentation to not more than twice their present level. This leaves a surplus of nearly 300 thousand m^3 by 1990. In total therefore markets will need to be found for 0.5 million m^3 of sawn softwood during the next 15 years, outside the present market distribution. The most likely area for development is in the higher value added markets, furniture, D.I.Y. and in construction.

Both furniture and D.I.Y. sectors are highly specialised markets for sawn softwoods; the former being restricted almost exclusively to pine and the latter, though not so species specific, tending to favour joinery grades rather than general construction timbers. Both have high demands on quality which are difficult to meet. Both share with the construction end uses a market requirement for guaranteed quality control, product performance and the need for far better presentation, than is characteristic of mining, pallets, fencing and sheds. It is then in the higher value added market sectors that the challenge to British softwood lies.

Market Structure for Industrial Softwoods in Britain

The considerable trade in industrial softwood from Scandanavian, Russion and Canadian suppliers into Britain is made by two predominant factors. First every piece or parcel of wood is graded to an internationally recognised standard, so that the vendor and purchaser have a common basis for nnegotiation. Second a considerable institutional market structure has been built up which enables goods to be channeled between producers, from forest and sawmills, via shipping lines, to improters and merchants where each sector may be separated by 100's or 1000's of miles and beset by language, cultural as well as national boundaries. The whole is supported by financial institutions, brokers, agents and finance houses. The industrial softwood trade is therefore highly structured, based on a long tradition of experience and trust, and is rather more conservative than it would like to believe itself to be.

By far the most important aspect of the trade is its reliance on grading, and yet paradoxically technology has only recently been a characteristic of grading rules. Initially grading was only concerned with a description of the goods, based loosely on appearance, the best being accurately sawn clear timber, the worst containing considerable quantities of natural characteristics such as wane, knots, pitch pockets, diagonal grain so that the piece hardly held together. However all pieces are graded.

If the trade in British softwoods is to extend its market range into the value added sector of construction and joinery it must first recognise the technical criteria which govern grading and fit its product to these criteria, then it must decide on the institutional factors to be used in its market strategy.

(i) Industrial Softwood Grading

The grading of industrial softwoods in Britain has undergone considerable changes in the past decade. Commercial grading (Table 7) formed the base of a clearly understood system designed for the easy transfer of goods from shipper to end-user without the necessity of inspection. End use was never a feature of the system and quality recognition was confined to the super-imposition of shippers' marks on grades, giving some allowance towards products arising from superior mills cutting superior quality trees. Performance recognition was less clearly understood and required consideration of strength and quality for construction and joinery, these were identified by British Standards, by Codes of Practice and by Building Regulations. British softwoods do no figure in the Commercial Grades (see Table 7), although they may be recognised as roughly equivalent to V and

TABLE 7
Commercial Grading of Industrial Softwood

Norway, Sweden, Finland, E. Canada			Russia		Pacific Coast of N. America
					No. 1 Clear usually sold as No. 2 Clear and No. 2 Clear better
	%				
Grade I	5				No. 3 Clear usually sold as Select Merchantable separately
Grade II	10	Sold as Unsorted U/S	Grade I	Sold as unsorted U/S	
Grade III	65		Grade II		No. 1 Merchantable
Grade IV	20		Grade III		No. 2 Merchantable or as Select Merch. no. 1 merchantable
Grade V			Grade IV	(Wracks)	
Grade VI		(Untskott or Wracks)			No. 3 Common

VI from Scandanavia. By custom and practice this would identify the potential market as, better qualities for carcassing and average and lower qualities for pallets, packaging and mixing timbers.

Performance standards in construction are shown in Table 8, an extract from Code of Practice 112. Here, quite clearly entry into construction is possible for Douglas fir, larch and pine. For spruces there are strength limitations which preclude such use if normal dimensions for building timbers are to be used. The use of larger sizes to meet strength requirements, though possible, involves market disadvantages. The CP 112 classification is made to ease design problems when working with readily available stock sizes.

TABLE 8
Strength Groups of British Grown and Imported Softwoods

Strength Group	Admitted Species (I = Imported) (B = British)	Basic Stress Dry Condition (up to 18% moisture content)			
		Bending	Compression	Modulus of Elasticity	
N/mm²		N/mm²		Mean	Minimum
				(——N/mm²——)	
S1	Douglas fir (I)				
	Douglas fir (B)	17.2	13.1	9700	4800
	Larch (B)				
S2	Redwood (I)				
	Whitewood (I)			8300	
	Scots pine (B)	13.8	11.0		4500
	Canadian Spruce (I)				
S3	Sitka Spruce (B)			6900	
	Norway Spruce (B)	10.3	8.3		3800
	W.R. Cedar (I)				

Source: Selected from Code of Practice 112 CP112 Part 2: 1971).

The spruces are weaker, (4) first because they arise from younger trees of merchantable size (a factor of site productivity); second because for a given building component dimension they have less rings per cm (a factor of the biology of tree growth); third within the annual ring the density of the earlywood zone appears to be considerably less than in the earlywood of European grown spruce (a factor of physiological significance).

CP 112 bases its strength characteristics on the basic strength, i.e. on the strength of clear material free of strength reducing factors such as knots and fissures. In practice, some strength reducing features are present in industrial softwood, and in design this is recognised by grading each piece of each species into one of a number of stress grades either visually or mechanically. The stress grades are assigned as a percentage of the basic strength derived from clear material.

Thus 75 grade is equivalent to 75 percent of the basic strength, the lost 25 percent being due to strength reducing factors. In 1971 CP 112 recognised four grades — 75, 65, 50 and 40, two composite grades 75/65 and 50/40, and two mechanical grades M 75 and M 50. The system had become so unwieldy that if all possible species listed in CP 112 were combined with all possible grades, over 500 bending stresses alone would be possible. Little wonder then that architects continue to use such specifications as "Best possible unsorted redwood north of latitude X", — a direct reference to the supposed outmoded commercial grades.

In 1973, a revised British Standard, BS 4978 "Visual stress grading of timber" was introduced. This reduces the visual stress grades to two, General Structural (GS) and Special Structural (SS). The system is heavily dependent on the use of the Knot Area Ration (K.A.R.) using both the size and position of the knot in the board, defining the serious hazard positions as in the board margins — the upper and lower quantile of the depth of the piece.

Clearly too much time had been spent on minute details and the old CP 112 had become too complex and self defeating. The code is however tied in with many other documents which still refer to numbered grades — e.g. the trussed rafter code. Notwithstanding, CP 112 is to be rewritten and new systems incorporating BS 4978 are expected in early 1979.

Events in Britain have been matched by events in Europe. The Timber Committee of E.C.E. (Geneva) has recently agreed to try and harmonise stress grading (5). A system based on the K.A.R. is being discussed, using three grade profiles which will also be linked to machine grading. The grades apply at the moment only to European timber but they offer a basis of a simple performance system based on minimum stresses. The three units proposed are S 6 ($18N/mm^2$), S 8 ($24N/mm^2$) and S 10 ($30N/mm^2$). Grade S 6 is almost exactly equal to GS (BS 4978). S 8 is a slight improvement over SS and S 10 is equivalent to the highest stress grade we have M75 (measured by machine stress grader).

For British industrial softwood the problem now is to meet the new levels of specification. For visual stress grading the most debilitationg influence is that of knots, a factor under some control in forest management. Ring width specifications for by GS and SS are "not less than 4 per 25 mm" a rate of growth not likely to be exceeded in sawlog rotations except on the fastest sites. Slope of grain limitations (GS 1 in 6; SS 1 in 10) are liberal for British timber; wane, checks, splits and pitch pockets are controllable in the sawmill. The problem of strength remains.

The Building Regulations, (to which the building inspectorate operates) in the 1977 revision include the GS and SS grades both

visually assessed and machine graded. (MGS and MSS). In the span tables of these regulations most of the widely grown British timbers are included. A section of the origin and grade of timber applicable over common span ranges (Table to Rule 2 in Schedule 6 of the Building Regulations) is shown in Table 9. The purpose of Table 9 is that of comparison rather than detailing the actual spans referred in the Regulations.

TABLE 9
Tablew to Rule 2: Species: Origin and Grade of Timber to which Tables 1-24 in Schedule 6 Relate

Species	Origin	Grade in Relation to Span Table	
		1-12	13-24
Douglas Fir	British or Imported	GS or MGS	SS or MSS
Larch			
European	British	GS or MGS	SS or MSS
Japanese	British	GS or MGS	SS or MSS
Pine			
Scots	British	GS or MGS	SS or MSS
Redwood	Imported	GS or MGS	SS or MSS
Whitewood	Imported	GS or MGS	SS or MSS
Spruce			
Sitka	British	M75	—
Norway	British	M75	—

Source: Building Regulations 1977.

Clearly the doubts on the strength of spruce dominate the use of this material in construction. No such doubts appear for the pines, larches and Douglas fir. The advantages of machine grading for spruce are also shown, indeed imperatively emphasised.

(ii) Visual vs Machine Grading

Visual stress grading evaluates the influence of strength reducing factors on basic stresses by visual inspection. Inevitably there needs to be an emphatic safety component in the quantitative estimates used, size and distribution of knots, fissures, wane etc., to ensure that the minimum stress value is reached. Machine grading on the other hand involves a quantitative estimate of strength for each piece. Thus the actual, rather than the assumed strength is calculated. For British industrial softwoods the comparison between visual and machine stress grading is salutory. Table 10 summarises such a comparison for stress grades 50 and 75. The implication for spruce especially is clear, although it is emphasised that the results presented do not represent average values from commercial parcels.

TABLE 10
Stress Grading of British Industrial Softwood

Species	Method of Grading	Grade Out-Turn (%) 75	50	Reject
Scots Pine	Visual	6	40	54
	Machine	70	23	7
Sitka Spruce	Visual	4	34	62
	Machine	83	15	2
Douglas Fir	Visual	3	26	71
	Machine	14	43	43

Source: B.R.E. 15 5/74

Machine grading is not cheap, and the minimum throughout for economic use is some 7,000m³ per year. Dependent upon the range of infeed and outfeed facilities required capital investment will be in the order of £40,000 to £60,000, (1976 figures) for the minimum quantity. Because of the increased yield of acceptable or improved grade material machine grading can be cheaper than visual grading, especially where products are graded for a specific end use. Table 11 shows the comparison of machine vs visual grading, based on 1973 figures, for an actual production run of grading for trussed rafters (6). The saving shown for machine grading is £3.96/m³, set against a production rate of 500 trusses per week the pay off time for the cheapest machine (£20,000 at 1973 costs) is less than 50 weeks. This is of course setting machine grading in the best context.

TABLE 11
Cost of Machine Grading for Trussed Rafter Manufacture Compared with Visual Grading

Basis of Costings

Timber = £66/m³ using Russian Unsorted Whitewood
Labour = £0.98 per hour
No. Trusses = 144
Timber used = 16.7 m³

Description	Machine	Visual
Normal yard operation	6 man hours	6 man hours
Sorting, grading, stacking	2 man hours	12 man hours
Rejects	1.5%	12%
Costings	**£**	**£**
Labour per m³	0.47	1.06
Rejects, reduce value by 50%	0.50	3.86
Initial Cost	66.00	66.00
Cost/m³	66.96	70.92
		66.96
	Machine grade Saving/m³	3.96

Source: Serry (1974) Twinplate Conference.

For general purpose grading in the construction industry the picture is not so easy to define. To achieve a production run of 7,000 m^3 of construction timber, say 40 percent of gross production, would require a log imput of 30,000m^3, assuming a 58% yield from logs. In other words a specialist mill, of very high capacity.

For joinery timber there is no doubt that British softwoods, especially the pines, is an acceptable product. For the spruces machinery problems associated with the more rapid growth rates, and the generally poor natural durability as well as difficulties in preservative treatment will severely affect the potential of these species in joinery (7).

(iii) Technological requirements — the end user's view

Figure 1 shows the results of a recent survey in Sandanavia in which a wide cross section of end users were asked to rate a set of technological criteria from 1 to 9 points. 9 is extremely important, 1 is unimportant. The most striking feature of this information is the consistently high geometric performance required throughout the end

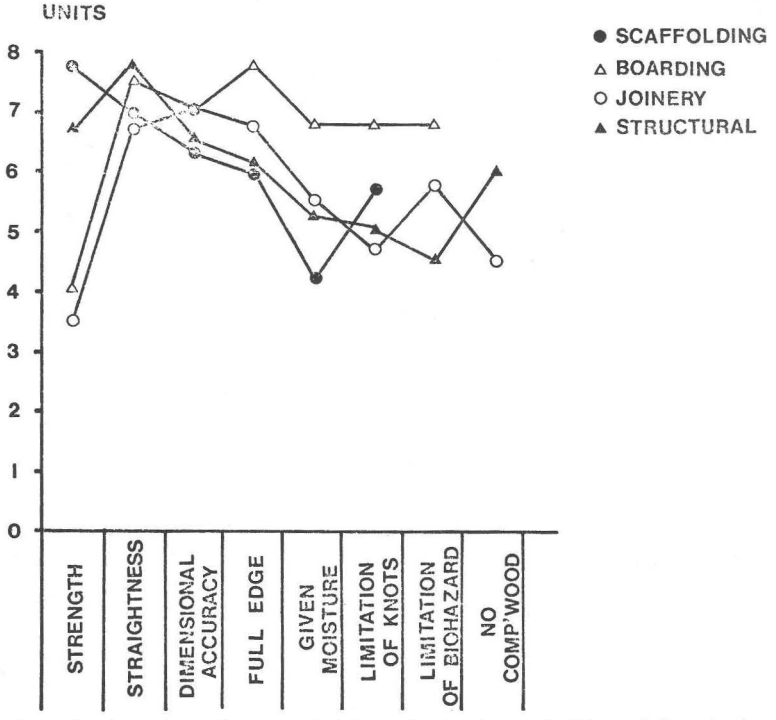

Figure 1. Comparison of Technological Properties Required of End Users. Softwood only.

use range. Strength too is important, its value in construction is underestimated in the graph because of the inclusion of roof sheathing in the figures. Consistency of board dimension is, of course, considered a *sine qua non* by sawmillers. From end users however there is strong evidence of the purchase of a higher than required grade to ensure geometrical precision, sometimes moving into machine stress grades to achieve this end because here at least dimensional accuracy is mandatory.

(iv) Institutional factors in the marketing of British Industrial Softwood

There are a number of choices open to the British sawmillers marketing the expected increase volume of industrial sawn softwood.

1. To market within the existing institutional framework, summarised in Figure 2. Here access will be either at importer or

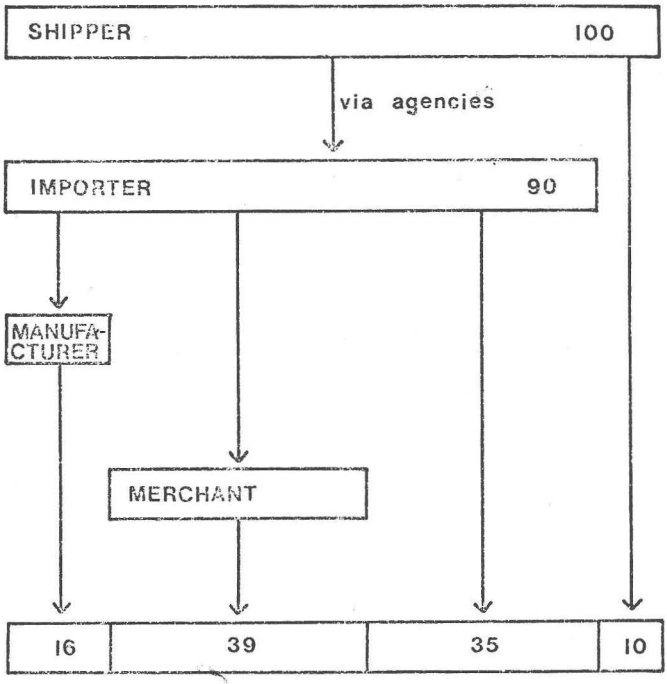

Figure 2. Outflow of Imported Industrial Softwood in Britain — Units % Imports. Source: U.C.N.W. 1972 — Adapted to 1977 conditions.

merchant level or perhaps via the agents. The sawmiller in fact becoming the shipper. Goods will need to be presented as those imported, i.e. graded, package and dried to at least a 'shipping dry' condition. They will also be required to be supplied regularly to both specification and quantity criteria. Considerable improvement will be needed in all the technological areas where British sawmilling is weakest to meet the demand and marketing via the imported trade institutions.

2. Production of timber in similar sizes, grades and specification to those imported, but with the British trade carrying out its own marketing and distribution. One problem here is the undercapitalised state of the British trade, another is the lack of experience in national distribution and marketing. Of advantage is the promotion of a British product produced to British specification. The imported trade cannot be expected to participate in such jingoism!
3. Supply speciality items to large scale manufacturers. The prerequisite is to identify the markets which are likely to produce the best returns. Among the value added markets some obvious targets are timber frame housing, particularly walls, e.g. studs — a potential outlet for machine graded spruce, and roof trusses — potential for pine and Douglas fir. The advantage is in limited markets supplied to exact specification,dimension, moisture content and preservative treatment if required.
4. To supply a wide range of outlets, choosing to operate in those which seem most profitable at the time. This is an extension of the present marketing arrangements and it is difficult to see how these can be organised into the value added sectors while at the same time maintaining the profitability needed for capital investment.

At the present time there appears to be no easy solution on the basis of the present fragmented nature of the British industry. Doubtless a solution will evolve, clearly it must be based on the larger more efficient mills, probably it will arise from sawmills closely tied into captive markets through financial involvement with either the finished raw product or the sale of residues — an item important to all profitabilitycalculations in sawmilling.

There is a considerable challenge ahead for British sawmillers, and the structure of the trade will certainly be different in the year 2000 from that presented today. The challenge is generated because of the success achieved by growers facing the challenge of the need for more industrial solftwood for Britain's forest based industry. Their success was achieved through considerable State participation in their activities. Little State assistance is available to sawmillers, perhaps it is time there was some!

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