NEW ZEALAND'S EXPORTS OF LOGS AND SAWNTIMBER TO JAPAN

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ABSTRACT

Exports of logs from New Zealand to Japan began in 1958 and of sawn squares over 160 mm thick, in 1967. In 1972 sales represented about 25% of total roundwood removals; they dropped to about 10% in 1982. The margin per m^3 of sawn squares over logs dropped from about 50 to 30% from 1968 to 1982. There is no such margin for competing U.S. hemlock. Real prices in Japan of all softwood log and large-sawn imports have dropped at generally similar rates since 1972. Larch logs from U.S.S.R. have supplanted radiata pine as the cheapest softwood since 1974.

The past basis of marketing — minimum effort and cost through the major trading companies — of salvage or often of poor logs (sawn in Japan and sold ungraded) was effective, in the sense of being profitable, as there was a sufficient market for the material. Although over 75% of all other softwoods are used in construction, over 75% of radiata pine is used for packaging. Lack of grading and seasoning may prevent any improvement, and there are no prospects for increased sales in Japan from the expanded afforestation programme, unless the timber is graded. If grown here and graded in Japan, total sales would be restricted by the need to dispose of the 50%+ of low-grade timber produced from New Zealand raw material.

Research is needed now on the returns from selective crosscutting; on sawing short-length logs and on the export framing grade potential of the new crop stands. Much more specific information on plantation quality is required, while marketing has to be fundamentally changed.

1. INTRODUCTION

The economic resurgence of post-war Japan, coupled with shortages of raw material, generated enormous demands for imports — including forest products. The heavy war-time cutting of the forests, the rebuilding of the devastated cities, and a

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traditional preference for timber resulted in an unprecedented volume of wood imprts. The well-developed sawmill industry, and the structure of post-war Japanese economy led to the dominance of logs in these imports. New Zealand, together with other Pacific rim countries, has become increasingly affected by this demand for imports.

Although New Zealand supplied only 1–2% of total Japanese wood demand, the exports of logs and sawntimber was about 28% of total New Zealand wood production in 1970. However, this had fallen to about 10% in 1982 (N.Z. For. Serv., 1983). The Japanese market is of great importance to New Zealand and the decline in the volume and proportion of exports is of major concern.

This paper reviews past log and sawntimber exports since 1967. The present sawntimber market is briefly discussed. Future trade prospects for these products — based on New Zealand's expanded post-war plantations — are assessed. The wood-chip trade has been described elsewhere (Fenton, 1982) and has been sustained at 1975 levels or better. The other current major export — mechanical pulp — is not considered here.

2. THE PRESENT (1983) SITUATION IN JAPAN

This is relatively straightforward. Sawntimber demand is mainly for softwoods. The Japanese species are in limited supply until production from the 10 million ha of post-war plantations increases with age. Imports are still projected to be about 57% of total wood demand in 1996 (Forestry Agency, 1983a).

Japanese stumpages in 1982 averaged 9, 18, and 37.5 thousand yen per m^3 for pine, sugi (*Cryptomeria japonica*) and hinoki (*Chamaecyparis obtusa*), respectively (Forest Agency, 1983a). These are, for example, about five times higher for pine than for domestic sawlogs in New Zealand (N.Z. For. Serv., 1983), and are high by North American or Australian standards. Even so, stumpages declined in real terms from 1974. Forest ownership — which is largely controlled by more than three million private owners — has responded by offering lower volumes for sale.

It is the high tree cost in Japan, coupled with the preference for wood and the supply deficit, which makes the export trade so attractive to international suppliers.

The Japanese sawmilling industry — of 20 to 24 000 sawmills — is the fourth largest in the world, and is predominantly of

small sawmills dispersed throughout Japan, though there are concentrations of larger mills at main ports. Imported stocks are held in log or flitch form, rather than as sawntimber; are sawn to order; and are not usually graded. Most softwood utility timber is sold and used in a green condition, although a proportion of packaging timber is air-dried.

The traditional preferences for straight-grained, close-grown softwoods with small knots are strongly held and can be met — at great cost — from the post-war Japanese stands.

Wood preservation is limited. For example, about 41% of the total sawn production is treated in New Zealand (N.Z. For. Serv., 1983). But the proportion preservative treated in Japan is less than 1% (Forestry Agency, 1983b); this has not altered significantly for at least eight years.

3. JAPANESE SAWNTIMBER DEMANDS

Table 1 shows the changes in total sawntimber consumption; the share of imports, and the *per capita* consumption of sawntimber in Japan from 1965. Japanese sawntimber consumption *per capita* is much higher than that of the United Kingdom, France or West Germany — countries which have similar GNP/head. It has, however, fallen by 25% since 1970.

TABLE 1: JAPANESE SAWNTIMBER CONSUMPTION

1 Y.E. 31/12	2 Population (million at y.e. 30/6	3 Production ($million\ m^3$)	4 Sawn imports ($million\ m^3$)	5 Exports ($million\ m^3$)	6 Consumption ($million\ m^3$)	7 Consumption /head (m^3)
1965	98.3	*32.4	0.8	0.3	32.9	0.33
1970	103.7	42.2	3.0	0.2	45.0	0.43
1975	110.9	37.5	2.6	0.1	40.0	0.36
1978	114.4	38.8	3.9	0.1	42.6	0.37
1979	115.4	39.6	5.1	0.1	44.6	0.38
1980	116.3	36.8	5.6	0.1	42.3	0.36
1981	117.2	32.5	3.9	0.1	36.4	0.31
1982	118.4	31.1	5.0	0.1 say	36.0	0.30

6=3+4—5 7=6 divided by 2

Sources: 2 Population of Japan. *Japan Statistical Ytarbook cited* in Ministry of Agriculture, Forestry and Fisheries.
3 Forestry Agency, 1982a.
4 & 5 Forestry Agency, 1982b.

*Estimate from log input.

TABLE 2: JAPANESE FOREST PRODUCTS IMPORTS — SHARE OF WORLD TOTALS

Category	*1979*		*1980*		*1981*	
	Amount	*%*	*Amount*	*%*	*Amount*	*%*
Sawn softwood (million m³)	4.7	7	4.9	8	3.4	6
Hardwood (million m³)	0.4	3	0.5	4	0.5	4
Plywood (million m³)	0.1	1	0.1	2	—	0.4
Woodpulp (million mt)	1.7	9	2.2	11	1.7	9
Newsprint (million mt)	0.1	1	0.1	1	0.2	2
Other paper (million mt)	0.4	3	0.4	3	0.4	3

Percentages corrected to 1%.
In addition, very small amounts of particleboard, fibreboard, and printing/writing paper were imported.

Source: FAO, 183.

TABLE 3: JAPANESE PRODUCED SAWN TIMBER: SOURCES AND END USES — 180
(million m³)

	Construction									
	Boards	*Scantling*	*Squares*	*Sub-total**	*Public Works*	*Packaging*	*Furniture*	*Transport*	*Other*	*Total**
Japanese	2.9	3.5	5.5	11.9	0.5	1.0	0.7	0.1	0.7	14.9
Imported logs and flitches										
Lauan	1.4	0.5	0.3	2.2	0.1	0.4	0.7	0.1	0.2	3.8
N. American	1.3	3.6	5.0	9.9	0.3	0.5	0.4		0.3	11.4
U.S.S.R.	0.6	1.8	1.3	3.6	0.2	0.2	0.1			4.2
New Zealand				0.2		0.7				1.0
Other	0.1	0.2	0.1	0.4	1.0	0.3	0.6	0.1	0.2	1.7
Total	6.4	9.6	12.3	28.3	1.2	3.2	2.5	0.3	1.4	36.9

Figures correct to 0.1 million.
*Totals may not add owing to rounding.

Source: Forestry Agency, 1982b.

Table 2 shows the overall share of Japan's import of manufactured forest products in world trade. It is still relatively modest.

The share of timber sawn from imported, as against Japanese, material increased up to 1978, when it reached nearly 63% of consumption (Japan Lumber Association, 1982). The imported share dropped to about 57% in the depressed market of 1981. The end uses of timber from the various sources are given in Table 3 for 1980. The proportion in each major category has been remarkably constant, and in the period 1970-82, construction comprised 75 to 77.5%, packaging 7.6 to 9.1%, and furniture 6.5 to 7.5% of total use. The timber from Japanese, North Amercian, U.S.S.R., and "South Seas" countries follows the overall pattern: 80-85% being used in construction and furniture. But 75% of New Zealand timber is now used in packaging (Forestry Agency, 1983a).

4. JAPANESE IMPORTS OF LOGS AND SAWNTIMBER

Table 4 shows the sources of imports of sawntimber and logs; these include logs used in the plywood industry. From 60 to 70% of the "South Sea" imports — ("South Seas" countries are the Philippines, Malaysia, Indonesia, Brunei, and Singapore) are used in plywood, but little from other sources.

Imports are still dominated by logs and by large sawn squares or flitches. The imports of sawn timber in flitch-size is slowly increasing. There is a tariff of 8% c.i.f. value on sawn spruce-pine-fir less than 160 mm thick. This reduces to 6% by 1987 (Forestry Agency 1982a). Sawn Douglas fir (*Pseudotsuga*

TABLE 4: JAPANESE IMPORTS OF LOGS AND SAWNTIMBER
(million m^3)

Y.E. 31/12	*S. Seas*	*N. America*	*U.S.S.R.*	*N.Z.*	*Other*	*Total*
1965	8.8	4.2	2.6	0.4	0.8	16.9
1970	17.6	12.5	7.1	1.8	3.4	42.4
1975	15.6	11.6	7.9	0.5	2.6	38.3
1978	22.4	13.4	9.0	1.0	0.7	46.5
1979	23.1	16.4	8.0	1.3	1.2	49.9
1980	19.7	14.7	6.3	1.1	1.1	43.1
1981	15.5	10.7	5.8	0.8	0.4	33.1
1982	15.9	12.2	6.1	0.7	0.5	35.4

Source: Japan Lumber Association, 1983.

Figures corrected to 0.1 million; totals may not add because of rounding.

menziesii) and hemlock (*Tsuga heterophylla*) timber of this size is tariff free.

Over half of the softwood imports are from virgin forests, and are of high quality, as timber containing rot — the main defect — is generally proscribed. The U.S.S.R. exports are all from virgin forests. Over half the North American supplies are still from "old growth" (virgin forest); but the proportion of "young growth" — variously defined, but usually at least 70 years old — is already 40%. Much of this timber still has close-grown annual rings and relatively small branches. The smaller log size of much of the "second-growth" is no problem to the Japanese mills, which are used to their own, and to the U.S.S.R. logs. North American supplies can be sustained at slightly lower volumes indefinitely. Projections for the three Western States softwoods show growth reaches 72 million m^3, and roundwood prduction will be around 73 million m^3 per annum in 2030 (U.S. For. Serv., 1982). There will be greater increments in the south-eastern U.S.

The Siberian resource is being increasingly exploited in the U.S.S.R. The heavy infrastructure of railways (the new B.A.M. line north of the existing trans-Siberian, plus other northward spur lines, total over 5000 km since 1974); and roads for the natural gas pipelines open up more forest. Total exports to Japan have increased from 2 million m^3 in 1963 to a peak of 9.2 million m^3 in 1973; they were 6.1 milllion m^3 in 1982 (Forestry Agency, 1982b); Japan Tariff Association, 1967-82). The basic quality of the small diameter trees is high, with very close growth rings and small knots. About half the imports are now of larch (*Larix sibirica*), which, although strong and durable, is not very popular in Japan as it is harder than most other softwoods. The resource of over 55 thousand million m^3 in Siberia and the Far East (*e.g.*, Foreco, 1979) should last for many decades — perhaps centuries. Promotion of U.S.S.R. timber is not vigorous at present.

An increasing problem will be radiata pine from Chile. Though this costs more to freight, the expanded planting programme there is also largely for export. Only small volumes have been sold in Japan so far. These, too, have been of logs and large sawn squares, and have the same packaging market as New Zealand radiata pine.

In contrast to the softwood imports, the "South Sea" resource of defect-free, large-diameter hardwoods will be dissipated within 15 years. Other tropical resources of virgin timber are not of the

same uniform quality, are available in limited volumes, and are more remote from Japan. About a third of the "South Sea" logs imported are sawn — the majority are used for plywood. The first plymill using imported softwood logs (U.S.S.R. larch) started production in mid-1983.

5. JAPANESE IMPORTS FROM NEW ZEALAND

The volumes and — for sawntimber — the sizes of the Japanese imports from New Zealand are given in Table 5. New Zealand exports by volume and value are given in Table 6. Over 90% of the logs and sawntimber exported were of radiata pine (*Pinus radiata*). But miscellaneous species were also exported from 1967 to 1975, and volumes are listed in Table 7, based

TABLE 5: JAPAN IMPORTS OF NEW ZEALAND WOOD

	Logs (Pinus)		*Sawntimber*				
			*Large**		*Small†*		
Year 31/12	*Vol. (000 m³)*	*Val. (million Y)*	*Vol. (000 m³)*	*Val. (million Y)*	*Vol. (000 m³)*	*Val. (million Y)*	*Value Margin of Large Squares over Logs per m³ (%)*
1967	630	5693	15	229			(69)
1968	1273	12458	74	1077	3	42	49
1969	1596	15032	90	1263	9	132	49
1970	1681	16781	71	1045	6	297	47
1971	1728	18286	81	1274	8	130	48
1972	1774	17039	95	1366	9	132	50
1973	1605	17931	88	1550	15	297	58
1974	1094	19802	95	2566	19	541	49
1975	447	7375	71	1485	11	250	26
1976	800	11726	100	1955	8	160	33
1977	838	12150	176	3494	9	176	37
1978	775	9742	208	3552	13	220	36
1979	963	16193	264	5955	19	487	34
1980	777	19350	286	9145	45	1629	29
1981	497	10831	241	6489	16	502	24
1982	421	9031	251	7108	13	407	32

Source: Japan Tariff Association, 1967-1982.

*Thickness more than 160 mm
†Thickness less than 160 mm
Year of maximum volume underlined
There are also exports of pulpwood and of logs of other species
Values are c.i.f., in current yen.

TABLE 6: NEW ZEALAND EXPORTS OF LOGS AND SAWN TIMBER TO JAPAN; EXCHANGE RATE

Y.E. 30/6	Logs				Sawntimber				
	Vol. (000 m³)	Val. (million $NZ)	Val. ($NZ/m³) Current	Val. ($NZ/m³) 1973	Vol. (000 m³)	Val. (million $NZ)	Val. ($NZ/m³) Current	Val. ($NZ/m³) 1973	Exchange Rate* (Yen/$NZ)
1967	516	4.9	9.4	14.0					405.7
1968	1136	10.9	9.6	13.7	53	1.3	24.1	37.2	398.8
1969	1422	18.8	13.2	18.0	89	2.2	25.2	34.2	400.5
1970	1748	23.4	13.4	17.1	82	2.0	24.5	31.3	399.6
1971	1772	25.5	14.4	16.6	92	2.5	27.4	31.6	374.9
1972	1836	29.4	16.0	17.3	96	2.7	28.3	30.6	360.4
1973	1873	32.7	17.5	17.5	107	3.2	29.9	29.9	400.1
1974	1411	33.4	23.7	21.3	122	5.2	42.4	38.1	394.8
1975	694	17.5	25.3	19.8	81	3.9	48.7	38.2	317.6
1976	675	18.1	26.8	18.0	98	4.3	43.8	29.4	277.1
1977	999	27.6	27.6	16.2	148	7.3	49.5	29.0	245.0
1978	932	32.7	35.1	18.4	200	11.7	58.5	30.7	206.8
1979	893	35.0	39.2	18.1	268	17.7	65.9	30.4	236.4
1980	941	48.8	51.9	20.4	316	29.5	93.5	36.8	195.3
1981	682	42.8	62.7	21.4	342	37.1	108.6	37.7	180.6
1982	434	26.7	61.9	18.2	254	27.7	109.0	32.0	171.3
									152 5

*As at 31/12
Source: N.Z. Forest Service, 1983.
Total values correct to 0.1 million $NZ
Values per m³ correct to 0.1 $NZ
Values are f.o.b.

TABLE 7: JAPANESE IMPORTS OF LOGS OF SPECIES OTHER THAN PINES FROM NEW ZEALAND (000 m³)

Y.E. 31/12	Larch	Douglas fir	Thuja/ Lawson cypress	Conifer N.E.S.	Non-conifer N.E.S.*
1967	1.9		0.5	10.2	3.6
1968		3.1	0.9	6.1	8.0
1969				2.3	10.4
1970	0.1			3.1	5.4
1971	2.3	17.5		10.8	1.9
1972	3.6	23.4		7.4	
1973	24.3	20.4	0.9	6.8	3.0
1974	37.3	19.3	0.7	8.6	13.6
1975	2.8	3.6		0.5	3.9
1976				0.6	

*Including "lauan"!
Source: Japanese Tariff Association, December issues 1967-1976.
N.E.S.=Not elsewhere specified.

on Japanese sources. Both Corsican pine (*Pinus nigra*) and southern pines have been exported, but figures cannot be isolated from the trade statistics. The Corsican and southern pines have tended to go to the South Korean market.

The specifications for these products are undemanding. They have been largely unaltered from 1973, and specify dimensions rather than grades. The quality of the material is central to market expansion, and is analysed subsequently in this paper.

There have also been a few successful small exporters. These have managed to find the market for their products; to amend the product if necessary to maintain quality control and carry the risks of overseas ventures. Their products include finger-jointed wood, and kitset furniture.

6. PRICES

The f.o.b. values for New Zealand timber in Table 6 show that export values have at least kept up with inflation since 1973. This has only been possible by the fall of the N.Z. dollar from about 400 to 150 yen from 1970 to 1982. There were neither compensating price rises in Japan, nor increases in volumes of sales. The U.S. dollar fell from 358 to 354 yen, and the Canadian dollar from about 358 to 210 yen in the same period. U.S.S.R. roubles from 1975 to 1982 followed the U.S. dollar.

The New Zealand exports — except logs — have all received "export incentives" (subsidies) in one form or another, and at various times. Information on the level, time and total of these has not been made available. At present they appear to be over 10% of the f.o.b. price for non-log exports. So there are shadow exchange rate effects which are not analysed here.

The c.i.f. price trends of New Zealand logs and sawn large squares, when corrected by the Japanese Consumer Price Index, are shown in Fig. 1. This figure also shows the annual volumes imported. Corresponding price trends for radiata pine and competing logs are shown in Fig. 2.

The differential in value between logs and sawn squares of radiata pine has been reduced from about 50% in 1967 to 25-30% now (Table 5, Fig. 1). The freight differentials taken as the differences between f.o.b. and c.i.f. values have been irregular.

There are no differentials between U.S. hemlock logs and sawn squares. Further, Canadian prices for sawn squares of hemlock are lower than the U.S.A. prices for logs (and squares). The

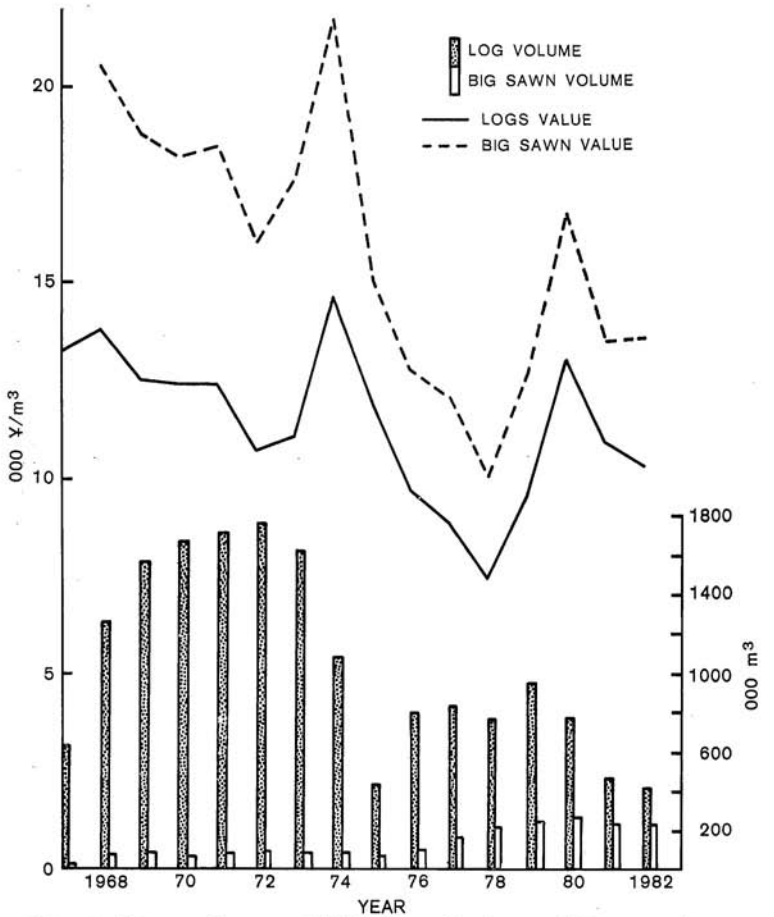

FIG. 1: *Japanese imports: N.Z. radiata pine logs and big sawn sizes; volumes and inflation corrected values.*

0 to 25% differential in value per m^3 is an example of the appeal of the phrase "value added by processing". The trade data of Malaysia and Singapore for lauan, the figures given here for North America, and those of New Zealand show that greater profits come from export of unprocessed material where the Japanese log market is available. New Zealand's dilemma will be that processing may, in fact, be necessary if increased volumes are to be sold.

Softwood imports all followed similar price trends, declining from 1973 (Fig. 2). The appreciation of the yen has resulted in

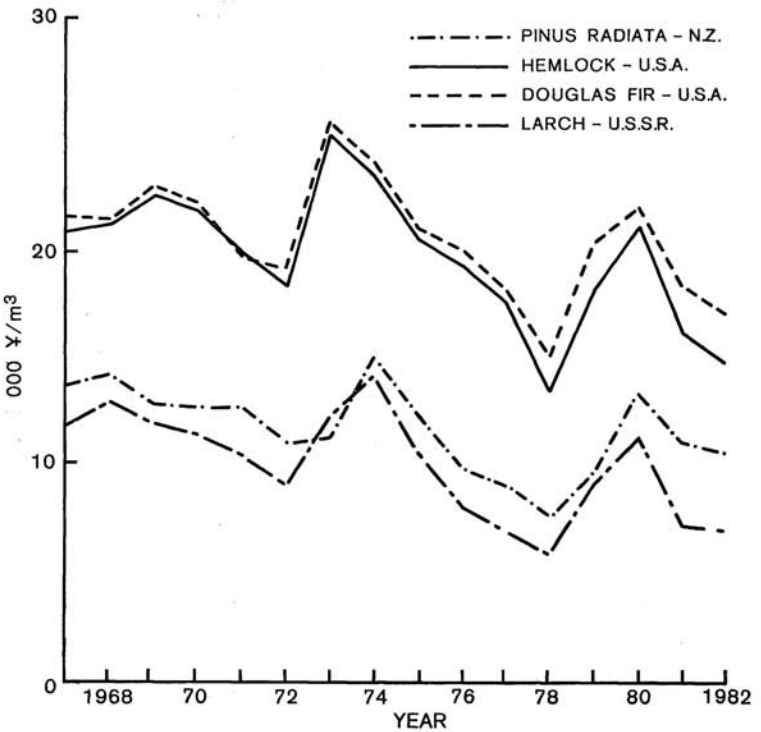

FIG. 2: *Japanese imports: inflation corrected values of U.S.A., U.S.S.R. and N.Z. logs.*

lower real prices in Japan. This is true for U.S.S.R. larch, pine, and spruce/fir logs, U.S. Douglas fir, and hemlock logs and large sawn sizes; and Canadian sawn hemlock; as well as the New Zealand imports (Fenton, 1984).

There have been, however, marked changes in price differentials between radiata pine and other species. These are shown in Table 8 for various categories. Log prices of radiata pine have improved against major competitors, but volumes have declined. The difference in 1982 of 8000 yen — about N.Z. $54 — per m^3 between large sawn squares of radiata pine, and final sized sawn Canadian hemlock represents the gross margin within which New Zealand producers would have to resaw, stress grade and dry the timber to compete. North American hemlock and Douglas fir sawntimbers are duty free in Japan, and the tariff would reduce the apparent N.Z. $54 margin.

TABLE 8: JAPANESE LOG AND SAWN TIMBER IMPORTS
(Price Relativities: Values in 100 Y/m³, current)

	Logs							*Sawn*						
Year	*Radiata pine 1*	*U.S. hemlock 2*	%* *2:1*	*U.S.S.R. larch 3*	% *1:3*	*U.S.S.R. pine 4*	% *4:1*	*Radiata† 5*	*C. Hem† 6*	% *6:5*	*Small C. Hem. 7*	% *7:5*	*U.S.S.R S/F† 8*	% *8:5*
1973	111	244	120	119	7	147	32	177	‡		‡		175	
1974	181	283	56	170	—6	208	15	269	254	—6	306	14	271	1
1975	165	275	67	142	—14	192	16	208	247	19	294	41	223	7
1976	147	284	93	119	—19	191	30	195	236	21	316	62	236	21
1977	145	279	92	146	0	202	39	199	241	21	322	62	254	28
1978	126	223	77	97	—23	155	23	171	191	12	254	49	194	13
1979	168	313	86	158	—6	261	55	225	357	59	360	60	313	39
1980	248	389	57	208	—16	351	42	320	369	15	425	33	422	32
1981	218	314	44	141	—35	257	18	270	293	9	338	25	245	—9
1982	214	296	38	140	—35	229	7	283	319	13	362	28	227	—29

*The % difference between the other source and New Zealand radiata pine.
†Large squares.
‡Sizes not differentiated.
C. Hem.=Canadian hemlock.
U.S.S.R. S/F=Small, sawn, U.S.S.R. spruce/fir.
Source: Japan Tariff Association, 1973-82.

The current f.o.b. values shown in Table 6 compared with the stumpages of N.Z. $11.08 in 1982 (export log value N.Z. $62) ensured the log trade was profitable.

7. DEVELOPMENT OF THE NEW ZEALAND EXPORTS

In the early days of the trade, port congestion was a problem (Seki, 1959; Gorrie, 1965), but was quickly solved by the Japanese. New Zealand logs are sent mainly to small ports — notably Susaki in southern Shikoku, and Matsunaga in S.E. Honshu. Other ports are Hitachi — north of Tokyo — for sawn squares, and a range of small ports in southern Kyushu and around the Inland Sea. Almost none arrives in W. Japan or the (self-sufficient) island of Hokkaido.

The New Zealand attitudes to this trade are exemplified by the 1965, 1966, 1969, 1971, 1977, and 1979 Forest Service annual reports which stated, for example, "[the log trade] was of immense benefit in disposal of timber from storm-damaged forests"; (logs from windthrown trees were also exported in 1983.) The New Zealand Institute of Foresters' journal mentioned " . . . the ability to quit rough, over-mature trees from farm shelterbelts and neglected woodlots [helps internal management]" (Anon., 1968).

In 1958-9, at the start of the trade, radiata pine was used for " . . . (a) casing for concrete works; (b) crating heavy cargoes, and (c) [temporary] piling" (Seki, 1959).

Then " . . . the wood itself is far too knotty for effective and economical use in high class construction. This . . . objection remains, but is offset by increasing demand for wood boxes and for certain types of construction where knottiness does not matter . . . it is not used for building purposes . . . [but] for boxes, crates . . ." (Gorrie, 1965). This is amplified in Gorrie, 1967.

References to quality in the Japan trade disappear, until significant changes in the early 1970s. In 1971, 41% of New Zealand sawn timber was used in construction, and only 38% in packaging (Japan Lumber Association, 1982). It was reported in New Zealand that [in 1972] " . . . the Japanese are gradually coming to realise that radiata pine is suitable for much higher grade use than industrial crating, cable drums and disposable framework on construction sites. Fifty percent . . . is now used . . . for house building" (Anon., 1973).

But "The [Japanese] Ministry of Agriculture, Forestry and Fisheries — MAFF) — did a survey of radiata millers and users

in 1972 and found a surprisingly high rate of use as structural material and a high incidence of twisting and breaking in use. (Most usage was green and ungraded, with larger members containing core-wood.) MAFF publicised its findings through the trade press and to industry organisations and urged that the use of radiata for structural purposes be stopped. This . . . seems to have continued from late 1972 to 1979" (Ashenden, 1979).

Recognition came: "The low regard for radiata pine has been caused by its poor performance in the early 1970s when [ungraded?] timber produced from ungraded New Zealand logs was tried out on a small scale for certain construction uses in Japan" (N.Z. For. Serv., 1979). Between 1972 and 1982 the New Zealand logs and large squares used by the Japanese sawmilling industry dropped from about 3.5 to 1.3% of the annual input (Japan Lumber Association, 1982).

There have been sales of sawntimber in final sizes from 1968, but even in 1980, when 45 000 m^3 arrived in Japan, volumes have been insignificant. This is fortunate. Block-stacked, unseasoned radiata pine sawntimber, unless of heartwood, starts to decay after a month or so. In New Zealand such timber is air-dried or further processed to prevent this. It is not in Japan, so stocks can and do decay, with disastrous results for the reputation of the species.

The percentage of New Zealand timber used in packaging may be as high as 90%, rather than the official 75% (Ashenden, 1979). This is supported by the geographically detailed figures in Table 9, which show 83-100% usage in packaging in the four prefectures where radiata pine is of any importance at all.

TABLE 9: JAPAN 1981 SAWNTIMBER PRODUCED FROM NEW ZEALAND MATERIAL

*Prefecture/ (Port)**	*Total Vol. Produced (N.Z. origin) (000 m^3)*	*% Packaging*	*N.Z. Timber as % Production of Prefecture*
Kochi (Susaki)	130	100	57
Hiroshima (Matsunaga)	123	83	11
Yamanashi	55	91	17
Ibaraki (Hitachi)		94	19
Overall Japan	806	75	

*Main port for N.Z. imports in that prefecture. Yamanashi is an inland prefecture near Tokyo/Yokohama.

Source: Forestry Agency, 1982c.

This relative concentration could help future strategies, whereby radiata pine could be sold in Kochi and Ibaraki specifically for packaging.

Sapstain of timber sawn from imported logs and squares is less severe than would be anticipated from New Zealand experience, if the storage has been in the sea. Most locally produced pine timber in East Asia is badly sapstained in any case if logs have limited heartwood, as the time between felling and utilisation is often prolonged. Much of the New Zealand material comes from trees over 50 years old, with higher proportions of heartwood than there will be in the planned export-expansion years.

Log and sawn exports were 24-29% of the cut in 1968-1970, and have fallen to 10-14% of the total cut in 1981-82 (Table 10). Sawntimber exports, as a percentage of exotic production, approximately doubled in this period. The main sawntimber exports continue to be large squares, with central pith. The timber sawn from these and the logs is sold largely ungraded in Japan. Some effects of this are discussed in Section 8.

There was internal debate over the log trade, and it was useful in providing alternative values for stumpages, and in maintaining and expanding production ". . not only for the periods between

TABLE 10: NEW ZEALAND EXPORTS TO JAPAN — % OF TOTAL EXOTIC PRODUCTION

	Sawntimber Export % of Production	*Logs Export % of Production*	*Total Logs and Sawntimber — Export % of Production**
1967		11	
1968	5	22	24
1969	6	24	27
1970	6	26	28
1971	7	25	27
1972	7	26	29
1973	8	26	28
1974	7	18	22
1975	5	9	12
1976	6	9	12
1977	8	11	15
1978	12	11	16
1979	16	11	17
1980	17	10	17
1981	17	7	14
1982	12	5	10

*Taking a sawn recovery of 50%. Figures corrected to 1%.
Basic Source: New Zealand Forest Service, 1983.

TABLE 11: INCIDENCE OF PITH IN RADIATA PINE

Location	*Remarks*	*Height up Tree (m)*						
		0-2.44	*0-4.27*	*0-5.5*	*5.5-11*	*11-16.5*	*16.5-22*	*22-27.5*
		(a) in 25 mm thick boards from flat sawing (No. of boards affected)						
Cpt 1219 (1) Kaingaroa	Ex regeneration	2.0-3.1	2.75-3.5	3.05-4.20				
Cpt 1045 (2) Kaingaroa	Ex 1.8×1.8 m planting			2.84	2.77	2.53	2.68	2.12
	Ex 2.4×2.4 m planting			2.54	3.24	2.87	2.37	2.29
Cpt 28 (3) Waiotapu	Ex dense regeneration			3.13	2.80	2.86	2.43	2.33
		(b) Measured extent in cm						
Cpt 28 (4) Waiotapu	Ex dense regeneration			7.6				
Cpt 1250 (4) Kaingaroa				7.2				
Cpt 1318 (4) Kaingaroa				7.8				
Patunamu (4)				7.9				
Mangatu (4)				7.6				
Waiuku (4)				7.0				
Golden Downs (4)				5.7				
Golden Downs (4)				6.6				

(1) Fenton, 1977.
(2) Fenton, 1967.
(3) Fenton *et al.*, 1971.
(4) J. Park, pers. comm. (From later studies of nominally straight logs).

local industrial expansions but in its own right, being far less demanding . . . [of resources] and subject to fewer environmental considerations . . . and [to help open] marketing options" (N.Z. For. Serv., 1976). This report also stressed the need to keep open a regular, lucrative trade.

No references were found that commented on the export of large sawn squares, but one original intention was to improve the appearance of the timber by anti-sapstain dipping.

Increased manufacturing in New Zealand contributed to the decline of log exports. Between 1970 and 1982, total exotic log production rose 40%, or 2 660 000 m^3. Pulp logs rose by 160% (2 100 000 m^3) and sawlogs 40% (1 410 000 m^3), leaving less to be exported as logs. The total exotic production could not be expanded further, as little forest had been planted between 1934 and 1955. The trade was a convenient and profitable way of disposing of a range of material, much of it of low grade, for which there were no profitable alternative demands.

8. THE COREWOOD PROBLEM

The low quality of corewood has been known for several decades when it was stated that in a properly integrated industry ". . . the central core of even the straight or better butt sawlogs is [should be] chipped" (Entrican, 1957). This paper contained statements on the low strength and spiral grain of corewood. Large squares of 20 to 30 cm sides almost always contain central pith. The juvenile wood and the complex of spike-knots, and the largest nuumber of defects per unit volume combine to make the wood from sawn squares of the lowest potential quality for framing. Their advantages are a high percentage of heartwood, when from old trees, so a lower propensity to rot, and easy handling characteristics. They are also the preferred form of imports in some larger ports (*e.g.*, Tokyo) as bark and slab disposal is avoided.

Considerable research efforts were made to overcome the natural Japanese aversion to this material. Unpublished work had shown that less than 20% of the gross volume produced by radiata pine plantations — even at close spacing — on rotations up to age 36 could ever meet the Japanese minimum ring-width requirement for structural timber (R. B. Tennent, pers. comm.). So alterations to the specified number of annual rings/cm were not attempted by the New Zealand forest products workers, and the corewood problem was approached in a different way.

TABLE 12: PROJECTED LOG SIZE: KAINGAROA FOREST*

Regime†	Age (yr)	Mean d.b.h. (cm)	Logs per ha at Clearfelling s.e.d. i.b. cm 30+	35+	40+	45+	50+	55+	60+
			(a) 3.4 m long						
370	27	45	462	293	116	57	22	2	
200	27	55	279	285	184	118	53	7	1
200	20	45	312	111	61	1			
			(b) 4.8 m long						
370	27	45	339	157	139	21	7	2	
200	27	55	206	200	184	53	22	6	
200	20	45	155	148	12	1			

s.e.d. i.b.=small end diameter inside bark.
*Site index 30 m — (tallest 100 trees/ha 30 m high at age 20 years).
†Stems/ha at clearfelling age.

TABLE 13: PROJECTED LOG SIZE: NORTHLAND*

Regime†	Age (yr)	Mean d.b.h. (cm)	Logs per ha at Clearfelling s.e.d. i.b. cm 30+	35+	40+	45+	50+	55+	60+
			(a) 3.4 m long						
370	34	45	444	236	96	34	2		
200	21	45	156	145	6				
200	34	60	158	156	290	96	52	18	
			(b) 4.8 m long						
370	34	45	220	216	34	9	2		
200	21	45	207	39	6				
200	34	60	116	154	136	96	18	3	

s.e.d. i.b.=small end diameter inside bark.
*On site index 24 — namely, tallest 100 per ha 24 m high at age 20 years.
†Stems/ha at clearfelling age.

The Japanese Agricultural Standard 600 — for "Platform Framing Construction Lumber" — was amended in late 1981; and the minimum annual ring number dropped for radiata pine (N.Z. For. Serv., 1982) for structural timber. Specifications required, among other things, that the timber should be a minimum of 5 cm from the pith. Unfortunately, pith is not straight in radiata pine, and the deviation recorded for nominally straight logs is given in Table 11. In the lowest 5-6 metres, pith deviates through a diameter of about 7-8 cm. The trees grow straighter as they get older, so pith incidence decreases but so, of course, does the trunk diameter.

It is not certain how far pith limitations apply to conventional (often called "traditional") Japanese buildings; so this paragraph is conjectural. The maximum number of logs of Japanese column length obtainable from two silvicultural regimes on average Rotorua and Northland sites are given in Tables 12 and 13, respectively, for two regimes computed for the same age, and the same mean d.b.h. (M. E. Lawrence, pers. comm.). If pith extends across 7-8 cm, and if the JAS requires wood 5 cm further from this, then the minimum log s.e.d. to obtain wane-less 10.5 cm squares would be 38 cm.* The figures in Table 12 show only about 20% of the 3.4 m long logs from a "Kaingaroa 370 regime" would yield these 10.5 cm squares. A wider-spaced regime of the same age, "Kaingaroa 200", would produce more — 363 as against 197 per ha. These figures are indicative only, as there are few published data on pith wander or of yield projections. And, it is not certain if pith restrictions apply to conventional Japanese column construction.

The lower site index, and so diameter potential in Northland (Table 13), makes the situation worse if, in fact, pith deviation is the same as at Kaingaroa. It is possible that the trees are straighter in youth, although there are no data published on this.

Platform frame houses based on 100×50 mm studs use relatively more timber than conventional Japanese column construction, but are quicker to build. About 1.5% of new houses in Japan are built in 100×50 mm timber, and the proportion is increasing steadily. This size could also be used in factory-built prefabricated houses, which comprise over 10% of housing starts. A higher proportion of timber that would meet the Japanese pith requirement could be produced in 100×50 mm sizes.

The better approach is to stress-grade the timber. The definition of "distance from pith" would be difficult to apply in

*Namely 7+5+5+10.5+10.5

practice. A higher proportion of beams (of rectangular section) than of 10.5 cm squares could be produced which would satisfy the current pith provision; but stress grading would be a surer course.

The aim of a framing or structural market is, in any case, debatable. The second-crop radiata pine will be much less suitable for framing than the 50-year or older first crop (it was largely unthinned, until natural mortality began at about age 20)

The proportion of export-grade construction timber available from this new resource cannot be expected to be high. But this proportion needs to be known, as it is basic in evolving an export strategy. The competing Japanese domestic logs, and future yields from the U.S.S.R. and North America will be largely of good framing grades (Fenton, 1984).

9. DISCUSSION

In 1968-70, when the first Forest Development Conference was planned and held, total annual export targets for 2005 were only 8 million m^3. This compares with over 20 million m^3 planned now. But few marketing studies have been published on Japan, apart from Ashenden (1979), though there were generalities on "softwood shortages" to the later Forest Development Conferences.

The main problem in changing New Zealand's approach to the Japanese sawntimber market is to remember and recognise the underlying facts since the trade began. To repeat, it has been a convenient and, for logs at least, a profitable means of disposal of windthrow, shelterbelt material, and other surplus wood. The sales, largely conducted through the great trading companies, have been made at low marketing cost. Curiosity as to what happened to the wood was muted; it was disposed of profitably, so why worry? This is understandable when annual exports were restricted to a maximum of 1.8 million m^3.

But it has been disastrous for the reputation of the species. New Zealand sawntimber is, in effect, cut-of-log. For the large squares, it is cut-of-the-worst-of-the-log. It is then sold in competition with ample supplies of basically high-grade softwoods, which have the attributes of small knots and close-grown wood favoured by the Japanese. This competition, when from North America, is backed up by permanent and able representatives in Japan.

It is inconceivable that radiata pine could be sold, on an expanding basis, on the New Zealand or Australian markets in

this way. To expect it to expand in Japan is futile, as shown by its decline in use in the 1970s and virtual relegation to the packaging market. The increased volumes — almost all destined for export — from the expanded afforestation programme are planned to be available from about 1990, so there are about six years to put things right.

Future research work should concentrate on techniques which maximise good grade yields in appropriate export lengths. Externally, a start must be made on proper market studies.

The obvious future gap in the Japanese market will be in finishing quality clear timber, currently obtained from South Sea material ("lauan"). The volume potentially available, and its quality for face veneer needs to be known. As Japanese sheets are predominantly of 6×3 feet, it would be logical to test acceptability of material from long internodes of radiata pine. The large range of timber sizes of lauan used internally in Japanese conventional houses need enumeration to see what volumes of graded (probably clear) and seasoned radiata pine could be substituted. It will be another matter to promote the material — once identified — to overcome the inherent objections to wide-ringed timber, reinforced by the disasters of the 1970s.

The framing situation is simple. First, the quantity of seasoned, stress-graded framing sawn to Japanese dimensions, which is available from the only likely areas (those with small branch size; straighter trees; higher basic density) has to be quantified, for 5-year age class steps. Then, if enough is available to warrant the effort, application should be made to amend the Japanese specifications to allow stress-graded timber, rather than the current pith-distance rule. The profitability of producing such framing (and all other lines) should be calculated. Growing framing timber was always a curious point to hold in rejecting short-rotation proposals. It is technically difficult to do in New Zealand and — if done — then faces the brunt of the competition from U.S.S.R. and North American softwoods.

It is unlikely that Japanese sawmillers will be persuaded to grade, and then promote, radiata pine. So if sales are to be expanded, sawntimber has to be graded in New Zealand. It is unlikely that this will be as profitable as log exports.

In any case, if graded in Japan, half or more of the sawntimber would only be fit for packaging or other lower uses.

The research and development needed in New Zealand should be based on the strategy of: Making the best of what is available.

This means a national: forest; stand; tree; and log basis of selection for quality. Nationally this means exploiting the known characteristics of the resource in different areas. For example, the best potential source of framing is on the Auckland and Northland sites, especially on clay soils. At the opposite end of New Zealand, growth characteristics are such that a higher proportion of clear-cutting grades are available than elsewhere, which would side-step the limitation of poorer basic wood density.

The organisation of log flow to and in the mills, especially the integrated plants, must be organised to utilise the crops to best economic advantage.

Immediate research is needed to quantify cross-cutting at selected points, rather than the 5.5 m multiples used at present. (These lengths reflect the current dominance of a domestic market.) For example, by cross cutting at branch whorls, rather than at internodes, one plant in Rotorua increased the yield of clear cuttings for export by around 10%. Large defects and critical defects should be identified as early as possible in the production flow and not, as at present, when upgraded material is landed at an importer's yard.

One long-term requirement is a thorough series of spacing trials of sugi and hinoki.

10. CONCLUSIONS

Overall, New Zealand has to find what it could technically produce to satisfy Japanese market requirements. Then these potential volumes should form part of a global strategy for the export role of the expanded plantations.

The means to formulate and implement such a policy have to be found now.

Facilitating overseas currency earnings should be the dominant aim of forest research and management. Marketing is an integral part of this, and has to direct the current sales efforts.

New Zealand's predicament is to make a fundamental change from selling on a past market of convenience to a future, much larger one of viable and economic necessity.

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