ROUND PRODUCE, PRICE CONTROL AND THE ECONOMICS OF SILVICULTURE

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SYNOPSIS

The market for round produce in New Zealand is relatively limited, but it is of considerable interest because the produce is not subject to price control. Treated round produce, both posts and poles, sells at the equivalent of nine shillings per cubic foot, compared with equivalently treated sawn timber at about the same price. Approximation of the price of sawn timber to that of equivalent round produce contrasts markedly with the trends prevailing overseas. This anomaly is due to price control which, together with moderate sawmill profits, results in a low residual stumpage for sawlogs. From an examination of the implications of this situation, the following conclusions may be drawn:

(1) If half the ratio prevailing in the United Kingdom between the stumpage for sawn material and that of equivalent round produce were to apply in New Zealand, timber prices would rise by about 30 percent, and stumpages by 450–500 percent.

(2) Profits in the preservation industry are high, and stumpages could be at least eightpence per cubic foot for round produce.

(3) It would pay farmers handsomely to grow their own fencing material.

(4) Pole supplies will be adequate from the second rotation crops, and pole markets should be expanded. Post supplies are likely to be grossly over-supplied.

(5) Preservation techniques are likely to improve very rapidly, and will give flexibility to silviculture and forest management.

INTRODUCTION

Grainger (1961) has already pointed out that the overall potential of the round produce market in New Zealand is limited, and it is not expected to rise above 5,000,000 cu.ft by the year 2000.

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TABLE 1: QUANTITY OF ROUND PRODUCE TREATED EACH YEAR IN NEW ZEALAND

Thousands of cubic feet

Year	*Fencing material*	*Poles*	*Other*	*F. S. Production Actual*	*% of whole*	*Total N.Z. production*
1952	—	—	—	324	—	—
1953	—	—	—	354	—	—
1954	—	—	—	396	—	—
1955	403	197	75	579	86	675
1956	598	131	24	629	83	753
1957	742	212	16	655	67	970
1958	778	292	41	932	83	1,112
1959	913	273	80	901	71	1,266
1960	1,320	522	11	981	53	1,853

Source – predominantly Yska (1961).

TABLE 2: QUANTITIES OF ROUND WOOD IMPORTED INTO NEW ZEALAND

Year	*Split Posts* Thousands of cu.ft	*Split Posts* Value (£ thous.)	*Split Posts* Value per 100 posts	*Logs and Poles* Thousands of cu.ft	*Logs and Poles* Value (£ thous.)	*Logs and Poles* Val. per cu. ft (shillings)
1947	33.8	7.2	21.3	433	128	5.9
1948	52.2	9.0	17.2	408	118	5.8
1949	92.6	20.2	21.8	400	132	6.6
1950	317.6	69.3	21.8	417	139	6.6
1951	203.4	40.8	20.1	392	151	7.7
1952	476.6	97.5	20.4	892	375	8.4
1953	299.6	56.2	18.8	550	274	9.9
1954	532.6	104.1	19.5	216	102	9.4
1955	580.7	110.0	18.9	350	186	10.6
1956	167.0	38.1	22.8	475	209	8.8
1957	199.5	39.4	19.7	450	307	13.6
1958	142.4	31.5	22.1	408	175	8.5
1959	6.5	0.7	10.8	283	110	7.7
1960	—	—	—	445	170	7.6

10 year mean 1950–59: 9.1*s* per cu.ft
Price basis is current domestic value in country of origin.
Source, Yska, 1961.

In 1960 about 1,800,000 cu.ft of round produce was treated with preservatives in New Zealand. This represents only a small proportion of the total forest produce. Table 1 gives details of the development of production since 1952. In addition, quantities of naturally-durable indigenous species were cut from State forests; in 1961, for example, this amounted to 440,000 cu.ft. The round produce market is of more interest than its relative size suggests, however, because produce is sold on a competitive market, which is not subject to price control. Competition with treated exotic round produce comes from durable native species, from concrete and from imported Australian hardwoods. Table 2 shows details of roundwood imports into New Zealand since 1947. Recent concrete fence-post production from commercial plants has been:

1956 – 1957	 2,974,000	posts
1957 – 1958	 3,201,000	,,
1958 – 1959	 2,528,000	,,
1959 – 1960	 2,540,000	,,

This paper considers some implications of this situation relative to the sawn timber market, to stumpages and to future forest management.

PART 1: THE EFFECT OF PRICE CONTROL

Competition and Selling Prices

Following are the current Rotorua prices per 100 fence-posts reduced to a net wholesale price at factory:

Concrete	£45	
Pinus radiata, treated with multi-salt preservatives	£42	$5\frac{1}{2}$–$6\frac{1}{2}$ in. small end diameter (s.e.d.)
Douglas fir, larch or Corsican pine treated with oil-based preservatives	£43 10*s*. £33	Size I: $4\frac{1}{2}$ in. minimum s.e.d. Size II: $3\frac{1}{2}$ in. minimum s.e.d.

These prices are equivalent to about nine shillings per cu.ft and are characteristic of prices elsewhere in New Zealand. Split red beech *(Nothofagus fusca)* and silver pine *(Dacrydium colensoi)* posts are in short supply in Rotorua, and usually sell elsewhere at prices somewhat above those of treated produce.

The equivalent price for poles bears a strong relationship to the price of imported Australian hardwoods; but a correction should be made for the greater strength of these hardwoods when compared with treated softwoods. Group B hardwoods (averaging 58 lbs. per cu.ft) are about 43 percent stronger, and Group C hardwoods, (averaging 49 lbs. per cu.ft) are about 27 percent stronger than softwoods of the same cross section (Hellawell, pers. comm.).

The prices for similar categories of poles may be compared in tables 3 and 4, below:

TABLE 3: PRICES OF N.Z. GROWN DOUGLAS FIR AND LARCH TREATED WITH OIL SOLUBLE PRESERVATIVES; AT ROTORUA (F.O.R.)

Size	*Min. butt diameter in.*	*Min. top diameter in.*	*Average volume cu.ft*	*Cost in shillings per cu.ft*	*Corrected cost, to equivalent hardwoods Group B*	*Group C*
16A	6½	4	3.1	10.95		
26A	8½	6½	9.6	8.7	12.4	11.1
30B	10	7	14.6	9.3	13.2	11.8
33B	10½	7½	18.0	9.3	13.2	11.8

TABLE 4: PRICES OF IMPORTED MIXED DE-SAPPED AUSTRALIAN HARDWOODS, AT MAIN N.Z. PORTS; (C.I.F.)

Size ft	*Min. butt diameter in.*	*Min. top diameter in.*	*Average volume cu.ft*	*Cost in shillings per cu.ft*
26	8	6	7.0	17.2
30	11	7½	14.5	13.75
33	12	8	18.7	14.0
35	14	9	26.4	13.3

(Importation via the Trade Commissioner may be cheaper than these prices suggest.)

A 26ft pre-stressed concrete pole, of much inferior strength, costs from £9 to £11, compared with £6 for an imported hardwood, and £4 4*s* 0*d* for a treated exotic pole. For comparison, the following table summarises current Australian prices (Dale and Hall, 1961):

TABLE 5: COMPARATIVE PRICES OF EXOTIC POLES AND VARIOUS SUBSTITUTES

			Substitutes as % of wood cost			
Size ft	*Untreated £ N.Z.*	*Treated £ N.Z.*	*Tubular steel*	*Fabricated steel*	*Reinforced concrete*	*Pre-stressed concrete*
30	5.6	10.4	177	277	146	223
40	8	15.2	247	289	168	289
50	12.8	23.8	324	293	183	276

Thus, pole prices here are as high as it is reasonable to expect, in comparison with hardwoods; concrete is very expensive, and is unsatisfactory as regards strength. Every concrete pole and post the forester sees should be a stimulus to him to get out and sell his produce.

Treated wood products are selling on a competitive market, and the prices given show that there is a strong relationship to the cost of alternative materials. Undoubtedly, in the future, import restrictions may affect the market.

Sawn Timber, Treated Round Produce and Price Control

The general value of sawn timber compared with that of equivalent round material in countries other than New Zealand can be summarised by quoting an Australian source:

> "Round produce is usually much cheaper than the equivalent sawn section" (Dale, 1961).

Prices in the United Kingdom provide good examples of the difference in value of equivalent produce. Current prices for sawn softwood mining timber – posts, rails and stakes – are from 90*d* to 108*d* per cu.ft, plus from 2*d* to 10*d* for cartage; peeled pit props, on the other hand, are about 52*d* per cu.ft at the mine (Hart, 1960). In 1938, the average price given was 19.4*d* per cu.ft for imports of sawn softwoods and 10.9*d* per cu.ft for pitwood; in 1952 these prices had risen to 126.8*d* for sawn softwoods and 69*d* for pitwood (MacGregor, 1953). Sawn timber was worth 78 percent more than pitwood in 1938, 86 percent more in 1952 and about 100 percent more in 1960. These prices are for the finished product. British Forestry Commission stumpages for 1960 were 12.5*d* per cu.ft for softwood material under 1.2 cu.ft, and about 19*d* per cu.ft for logs containing over 12 cu.ft (Hart, 1960). These are average prices for Forestry Commission standing sales; they vary considerably with distance from market and with the efficiency of the purchasing sawmillers. In the United Kingdom, stumpages are about 50 percent higher for sawlogs than for small produce.

Such a series of figures could be produced for a number of countries and, although there would generally be fluctuations in prices from year to year, a substantial margin would usually exist between sawn and round produce for similar end uses, and this difference would be reflected in the stumpage paid.

It is illuminating to examine the relative price structure in New Zealand for comparable materials. Pitwood has a minor market here, but fencing forms a major outlet for round produce. Number 2 size fence posts, of $3\frac{1}{2}$–$4\frac{1}{2}$ in. s.e.d. and 6ft long, can be compared with sawn 4 × 3 in. timber of Number 1 Framing grade (New Zealand Standard Specification 169). (Strictly speaking, an allowance should conventionally be made for the greater strength of a round cross section; this allowance has been ignored in the United Kingdom example and, for uniformity, is ignored here).

(1) Sawn 4 × 3, No. 1 Framing grade, cut to 6 ft lengths, and treated with 5 percent pentachlorophenol in oil preservative. The price structure (New Zealand Forest Service, 1962) is:

Wholesale No. 1 Framing	64.5*s*	per 100 bd.ft f.o.r.
Treatment Charge	42.0*s*	,, ,, ,, ,,
Cut-to-length Charge	5.0*s*	,, ,, ,, ,,
Total Price	111.5*s*	,, ,, ,, ,,
Price per 6ft length	6.69*s*	each
Less 7½% trade discount	6.19*s*	
Less 2½% cash discount	6.03*s*	per piece, with a volume

of half a cubic foot. If the timber is treated with a multi-salt preservative, to specified loading for ground contact, the equivalent price is 5.49*s* each.

(2) A No. 2 size post with a volume of from 0.4 to 0.7 cu.ft, treated with 5 percent pentachlorophenol in oil preservative has a price of 6.9*s* net (wholesale f.o.r.).

The 4 × 3 cross-section is equivalent to a post of about 4 in. diameter, or from 3.6 to 3.7 in. if the 18% correction does, in fact, apply to our treated produce. The 4 × 3 timber, in this grade, is free of pith, and hence must be cut from logs of at least 9 in. s.e.d., compared with a minimum of 3.5 in. s.e.d. for the No. 2 post. The timber is subject to considerably more processing than the post; this grade sells at well above the average mill selling price, and is profitable to cut – but at the cost of low, nominal stumpages.

These figures demonstrate that, under price control in New Zealand, the overseas situation is reversed and sawn timber can sell more cheaply than the equivalent round produce.

This is a curious situation.

Residual Stumpage Values – Round Produce and Sawn Timber

Forecasting timber price movements if, and when, price control is removed, is a dangerous pastime since prices depend on prevailing economic conditions. In the United Kingdom, two to three years after price control ended in 1949, the price of good quality logs increased two to three times, while prices of low quality logs rose only slightly (Hiley, 1954). It cannot, of course, be assumed that the same pattern would be followed in New Zealand if price control were removed. The United Kingdom imports most of its softwood requirements at prices which, in general, fluctuate according to shipping freight charges; consequently, home-grown timber prices also reflect such charges and the market is very sensitive to international tensions. The lifting of price control in the United Kingdom in 1949 coincided with the Korean war and a rise in freight rates. The New Zealand market would probably be more stable. Nevertheless it is reasonable to assume that, in the absence of price control, timber and round produce prices would adjust to a differential of 40 percent more for sawn timber over the equivalent round produce. The justification for this assumption is the relation established overseas between the prices of two products, which are chosen as the basis for argument because they are both major and standardised. The point at issue does not concern actual overseas prices. Two hypothetical cases may be considered:

(1) The case assuming that:

- (a) Price control is lifted;
- (b) Round produce maintains its current price structure;
- (c) Saw log stumpages reach 40 percent more than round produce stumpages.

Present round produce stumpages in Rotorua are about 7.5*d* per cu.ft for long length, unsorted thinnings, the exact stumpage varying according to forest conditions, length of haul, etc. For posts cut to length the "on ride" price is 2.35*s* per cu.ft, which with efficient management under reasonable conditions, is worth at least 16*d* at stump. Poles cut to length are worth up to 2.5*s* per cu.ft at stump. Taking the lowest figure, the saw log price should then be 7.5*d* + 40 percent, i.e. 10.5*d* per cu.ft. This represents a rise of 8.5*d* per cu.ft or 450 percent more than present values. (Furthermore, the current sawlog price is based on clearfellings, which result in a lower logging cost than thinning operations).

The net average cost of sawlogs at the mill would increase from 12.5*d* to 21*d* per cu.ft (allowing 6*d* per cu.ft for clear felling, and 4.5*d* for an average haul by contractors). Allowing a conversion factor of 6 in the mill the cost represented in the sawn timber price of logs, rises from about 17.5*s* to 29.2*s* per 100 bd.ft. Mill cutting costs are about 20*s* per 100 bd.ft and so total cost of production rises from 37.5*s* to 49.2*s* per 100 bd.ft – an increase of 11.66*s*. (Most of these costs are taken from Entrican, Hinds & Reid, 1957).

The average selling price of timber depends on width and grade, but is at present 47*s* per 100 bd.ft. On the above assumption, it would rise to 58*s* 8*d* – this is an increase of about 25 percent, compared with a stumpage increase of 450 percent. Mill profit would remain the same.

(2) The second case assumes that:

- (a) The price of round produce is too high and will be reduced by 25 percent. (This is justified later).
- (b) Price control is lifted.
- (c) Finished product prices are 40 percent more than prices of equivalent rounds.

Applying these assumptions to the comparison made earlier, the price of a No. 2 post would fall to 5.2*s*, and the 4 × 3 in. timber would increase to 7.28*s*. This results in a list timber price of 87*s* 6*d* per 100 bd.ft – a 36 percent increase. Taking this increase back to the forest, using the costs as in Case 1, results in a stumpage of 31.25*d* – an increase of over 1450 percent. This sort of figure shows very clearly the effect of price control. It allows for the inescapable costs of production – logging, hauling, sawing and sales. It allows mills to make a modest profit; and it puts a price on the raw material that bears no relation to its value.

Progress in forestry in New Zealand is obviously bound up with price control, and the effect of lifting it will affect the profitability of forestry to a greater extent than any other factor.

PART II: THE ECONOMICS OF ROUND PRODUCE PRESERVATIVE TREATMENT

The previously mentioned prices of round produce apply, within reasonable limits, in most districts in New Zealand. The stumpage being received, if based on the method employed in calculating sawmill stumpages, should be a residual value, after allowing for a reasonable profit for the treating plant.

Production costs for pressure plants treating round material are summarised in table 6.

TABLE 6: COSTS OF ROUND PRODUCE PRESERVATIVE TREATMENT

Stage of Treatment	*Processes using:* *Oil-soluble preservatives**	*Water-soluble multi-salt preservatives**
	Shillings per cubic foot	
Peeling	0.5	0.5
Stacking, seasoning and loading into plant	1.5†	1.5†
Treatment cost, excluding preservatives	0.8	0.6
Preservatives	1.7‡	1.1‡
Sales and handling	0.5	0.5
	5.0	4.2

* A variety of techniques are available, but these two processes are the major ones in current use. They necessitate air-dry produce.
† This is a relatively high figure.
‡ These are low costs, for preservatives imported direct, in bulk.

A cost of production and profit statement for a multi-salt treating plant would be:

	Pence per cu.ft
Logging cost, assuming the materials are from thinning operations and allowing 4.5*d* more than clearfelling cost	10.5
Contract haulage – 35 miles, return	4.5
Yard and preservation costs, as above	50.4
Total cost	65.4
15% profit allowance	9.8
Total cost, including allowance	75.2
Selling price	100.8
Residual stumpage, less 15% profit allowance	21.75
Total round produce plant profit	13.64

Thus the real stumpage value of posts, at present selling prices, is about 21*d* per cu.ft.

A stumpage of 3*d* on post material would ensure a high rate of profit of £12 10*s* per 100 posts; and in cases where actual costs are lower than those given, particularly for logging, hauling and seasoning, profits of up to £20 per 100 would be possible for the treatment plant.

If a profit of only 15 percent were allowed to the plant, and raw material did in fact cost 3*d* per cu.ft, the price of treated No. 1 rounds would fall to £33–34 per 100 – a drop of about 25 percent.

The moderate stumpage of 3*d* per cu.ft received in many areas, but not in Rotorua, for minor forest produce from first thinnings is a lot better financially than incurring a net charge by thinning to waste; but it is bad business to ask too low a price. For first thinnings an increase from 3*d* to 8*d* per cu.ft for, say, 1000 posts per acre from ten year old *P. radiata* would increase the financial yield by £13 (selling price discounted at 5 percent compound interest to the year of establishment). Thus a stumpage of 8*d*, which is still very modest under today's prices, would cover establishment costs in favourable areas.

It follows that for farm foresters, a very strong case can be made for growing their own posts. Barr (1962) has pointed out that a farmer can cut and treat his own posts for about £19 10*s* per 100, disregarding growing costs, but buying preservatives at retail rates and with none of the saving advantages of large-scale commercial production.

PART III: FUTURE SUPPLIES OF ROUND PRODUCE, AND THE EFFECT OF TECHNICAL DEVELOPMENTS

Undoubtedly, the post market could easily be flooded if all forest managements made serious attempts to exploit it; and there will be no shortage of posts in the second rotation of the three major exotic species. While any appreciable quantity of concrete products is being used, however, it cannot be said that the market is over-supplied.

Poles are much less likely to be over-supplied. In calculating future yields after 1970 much of the first rotation can be ignored, with the probable exception of slow growing strains of *P. ponderosa*. Yields from thinnings by the "New Look" second rotation silviculture will provide the bulk of future normal supply. Since very intensive thinning will result in a low stocking per acre by the time a top height of 70–90ft has been reached, *P. radiata* will not yield any appreciable quantity of poles. The bulk of these will come from the plantings of Douglas fir and Corsican pine made since 1940.

The mean quantity of wooden poles, both imported and locally treated, used during the five years 1956–60, was nearly 700,000 cu.ft per year. During these years there was generally a shortage of overseas exchange, and hardwood stocks were reduced to some extent. Assuming a small supply of indigenous species also, current demand would seem to be at least 750,000 cu.ft per year.

Douglas fir of Site Index 90 will produce a modest number of 26ft poles at about 30 years of age, and appreciable amounts of heavier poles by 35 years. Corsican pine, on a similar site, will have a Site Index of 60, and will produce 26ft poles at about age 42. The ultimate actual yield of poles will be more than adequate if the 1956–60 average planting of these species is maintained. Details of the method of estimating pole yields are given in the Appendix.

These very approximate estimates prompt two suggestions. First, there will be about double the present pole yield available in future, even at the present rate of planting: to accommodate this potential it would be desirable to extend pole useage now. The second suggestion is that attempts might be made to grow specialised crops of *P. radiata* on restricted favourable sites, where moderately dense stocking can be maintained and where tree form is good, in order to get poles in 20 years instead of 35. Some sand dune areas, for example, may be optimum sites for pole production. If compound interest considerations have any validity, and where site and tree form permit, it would pay to grow *P. radiata* rather than Douglas fir. Each £1 of establishment cost, after 20 years at 5% compound interest, becomes £2.65; and after 35 years it becomes £5.51. Since Douglas fir establishment costs would be about 10 percent higher than those for *P. radiata* it follows that the financial yield from growing the latter species to supply poles at 20 years would be much higher than from Douglas fir.

In conclusion, it is relevant to point out that in New Zealand technological advances in timber preservation are being made rapidly. Foresters who plant pine for intermediate yields of fencing produce must remember that fifteen year old thinnings of Douglas fir have wide bands of sapwood, and are then very easy to treat with a sap displacement method. We should remember, too, that it is feasible to use one pressure cylinder and pumping system for both oil and water based preservatives. The pine seasoning problem can be circumvented by adopting the method of oscillating pressure, by pre-steaming, by vapour drying or treating by sap displacement; any or all of which may reduce treatment costs. Forest management should be sufficiently flexible to take advantage of improvements in technique; and silviculture should not necessarily be tied to present day practices in the preservation industry.

APPENDIX: COMPUTATION OF POLE YIELDS FROM DOUGLAS FIR

1. Assumed: Site Index of 90; planted at 6 × 6ft; first thinning at 35 years to 220 stems per acre.
2. From the yield tables (Duff, 1956), this Site Index gives a mean d.b.h. of 11.1 in.; for which the diameter distribution by one inch classes is indicated.
3. The assumed thinning intensity must be applied.
4. The taper table (Burstall, 1959), for the 100ft height class (which is that appropriate to the Site Index at that age) is used to calculate the number of 26–36ft poles that can be cut from a tree in any individual d.b.h. class. This assumes that all the relevant diameter classes fall into the same height class: the 10–13 in. d.b.h. classes are the main ones concerned, and this assumption is not unreasonable.
5. The results are converted to a per-acre basis.
6. This method has been checked in practice against the Waipa Mill annual input, and it has been found that the actual pole yield is 40 percent of the hypothetical yield as calculated above.
7. The hypothetical yield is 110 poles per acre; in practice this is reduced to 44 poles per acre.

Acreages of Douglas fir planted in State Forests since 1940 have been:

1941–50	290 acres per annum
1951–60	1300 acres per annum

According to Spurr's figures (Spurr, 1961), the 1956–59 average has increased to 2,944 acres per year. At 44 poles per acre, this represents about 1.3 million cu.ft of poles.

Similar computations for thinned Corsican pine stands can be made, and at least 0.5 million cu.ft of poles can be anticipated from plantings of this species.

Unless crown thinning is adopted in the 1920–35 age classes, there may be a hiatus in pole yield for the period 1970–1980. Crown thinning of Douglas fir would permit the retention of more trees under 9 in. d.b.h., which would grow to pole size by the time of the second thinning. A more detailed estimate of pole yields is in course of preparation.

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