and Haast meteorological stations. This hot dry season was followed by a heavy flowering of beech in the spring of 1953. Concerning part of this flowering, Grayburn wrote (N.Z. Forest Service Report), "There is a prolific flowering in *N. cliffortioides* in P.S.F. No. 72 on the shores of Lake Hawea. There is also a good showing of the red flowering mistletoe."

The spring and summer months, 1953-54, were hotter than average in most parts of New Zealand, one of the exceptions being the west Otago region. In the following autumn fairly plentiful lammas flowering was seen in the beech forests around Wellington, and records of similar flowering were sent in from other parts of the country. As in the 1948 flowering year, this lammas flowering proved to be the forerunner of another good season, more particularly at lower altitudes. In general it appeared to be as heavy as that which occurred in 1948.

The flowering, whenever it occurred, seems to have been followed by good seeding, but this will not be commented on here. It has been measured in the beech forest west of Lake Wairarapa where annual measurements have been made since the 1949 seed year. These figures will be published later.

In the many records of the above flowerings *N. menziesii* was sometimes stated to have flowered along with the other species present. The most closely observed record, however, that of Bannister for the 1951 flowering in the Nelson district, referred to the flowering of individual trees of *N. menziesii* only. In the silver beech forest being placed under management, Rowallan Valley S.F. 53, Williams (N.Z. Forest Service Report) reported that seed years occurred in 1950, 1951, and 1953. Whether all trees seeded in these years, or only some trees seeded each year, is not known. These seed-years are not related to previous hot seasons. The anomalous behaviour of *N. menziesii,* and the frequent seed-years so far in this district, is particularly fortunate for this management scheme.

A. L. Poole.

A TOKEN SYSTEM OF PAYMENT FOR PIECEWORK THINNING

In Canterbury, forest management faces major problems consequent on insufficient supply of skilled forest labour and absence of any industry capable of absorbing large volumes of small diameter produce. These deficiencies result in high cost thinning to waste, with inevitable accumulation of silvicultural arrears. For Ashley Forest this is a matter for concern since the oldest *P. radiata* stands have reached the stage where maximum benefit would be obtained from treatment.

Incentive payments, under contract and piecework systems, have eased the labour problem elsewhere, particularly in pruning operations;

but application of these methods to thinning operations presented considerable difficulties. For example, area could not be used as the unit of control for obvious reasons. A new system of control has, however, been worked out; under this system rate of thinning has been more than doubled with a corresponding reduction in costs.

The stands requiring thinning are *P. radiata* stands planted 1939-42, 6 x 6 ft. spacing, present height 75 ft., d.b.h. to 15 inches. Final crop trees, only, have been pruned, 250-300 stems per acre, and half of these have been high pruned. Thinning to waste reduces stocking from 800 to 375 stems per acre, with a loss of up to 700 cubic ft. per acre, measurement to a 6 inch top. Diameter range of thinnings varies from 4-12 inches.

The forest floor is generally clean though there are areas where dead gorse impedes thinning operations. Terrain is hilly, with steep slopes occasionally broken by numerous deep gullies. There is therefore rapid variation in stand quality, almost from acre to acre, with considerable variation both in number of stems per acre and in stem form and size.

Time and motion studies were made covering the whole thinning operation. It was found that the only significant item was the time taken in the actual felling of stems of varying diameter. Times for all subsidiary operations, trimming before felling, movement from tree to tree, tool maintenance, and so on, were constant. Furthermore, it was found that significant increases in time for actual felling occurred only at certain points on the diameter curve, at six and nine inches respectively. Beyond nine inches there was greater change in time, but stems of greater diameter than this form only a small proportion of the thinnings, so that this variation could be disregarded.

It was possible, therefore, to group all stems in three diameter classes, fixing a felling price per tree as shown in Table 1.

TABLE 1

Group	D.B.H. Tree Class	Av.Felling Time in Seconds	Price Time in Seconds	Time Margin Seconds	Unit Price per Tree	Per cent Trees in Group
A	To 6.5	22	168	146	1.0	60
B	6.6-9.5	60	225	165	1.3	37
C	Over 9.5	120	300	180	1.8	3

The price time allotted is fixed on the basis of the mean time taken to fell stems of each diameter class, plus an allowance for all subsidiary operations and movements. No allowance is made for any loss of time arising through inexperience, for example, time taken in dealing with "hang-ups". The price time is considered to be the rate at which a competent axeman could carry out the work with a return of £2/13/0 a day irrespective of variations in the quality of the stand. With increased skill and experience, greater amounts can be earned.

Prior to commencement of thinning operations, all trees to be removed are marked with a slasher blaze. Branded brass tokens marked with a letter corresponding to one of the diameter classes are inserted in a downward cut, each token being 3 x 0.75 x 0.008 inches in size. Fixed calipers are used where there is any doubt in judging diameter class. For full control, marking is carried out immediately ahead of the thinning gang, not more than two days' work being marked in advance.

Before felling each tree, the axeman pockets the token and at the end of each day all tokens are handed in and recorded for payment purposes. Inspections of standard of work with a check for standing blazed trees left in treated areas are made before additional marking is undertaken.

With use of this system there has been an increase in the rate of thinning operations. Costs have been reduced and payments to operatives have remained more or less constant irrespective of changes in working conditions. It is a simple matter to fix the standard rates by time studies and these rates hold good for stands of great variability.

R. M. Martin.