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The development of pine logging in Western Australia

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ABSTRACT: The lack of usable softwood timber in the forests of Western Australia was of concern to the early settlers and by the end of the 19th Century pressure was being applied to the Government of the day to establish pine plantations in the high rainfall south-west of the State. After a few years of experimenting the first serious planting occurred in 1922 when about 8 hectares of *Pinus radiata* was planted at Mundaring Weir on an old orchard paddock. The first commercial logging occurred in 1935 and the progress from that start is followed from the viewpoint of the evolution of techniques for felling, extracting, loading and haulage, alongside the development of sawmills and other conifer products over the nearly 70 years since that simple start.
The progress through this development was at the pace of industry through the whole Western World, but was greatly assisted by some creative adoptions along the way. The first logs were cut in 1935 and sold to local sawmills, mainly to make wooden boxes including beer crates (which held an astonishing 5 dozen full size beer bottles). By 1955 there was a steady demand for case logs by small case mills mainly in the Perth Metropolitan area (post World War II) and the short-term labor shortage for log preparation was generally filled by European migrant workers.
By 1965 there was a small demand for mill and veneer logs in larger sizes. Felling started with Crosscut saws, then Bow-saws, Chain-saws and eventually by mechanical harvesters. Extraction by horse and sled, followed by modified agricultural tractors, and by ex-army trucks converted to Jib-cranes, then Forwarders and Harvesters.

1 THE ESTABLISHMENT PHASE

The early settlers in Western Australia were mainly from Britain, and although favourably impressed by the carpentry qualities of the native hardwoods like Jarrah (*Eucalyptus marginata*), they were accustomed to have access to softwoods from Europe and America. From a fairly early date, probably in the 1880s there was support for the concept of establishing pine forests in Western Australia. Part of the Department of Agriculture was set up as the Woods and Forests Department, and the first Conservator of Forests, Mr John Ednie Brown, was appointed in 1896. The Forests Department was then established in 1918.

A site south of Bunbury was chosen for the first plantation of pines. It was a patch of sandy dunes and no clearing of vegetation or soil preparation was considered necessary. Two year old seedlings were raised at the Hamel nursery, just south of Waroona, which had been bought from the Estate of Mr L V deHamel in 1897 and then allocated to the Woods and Forests Department.

The seedlings were mainly *Pinus radiata* (then known as *Pinus insignis*), a medium size conifer from the Monterey Peninsula of California, which had been successfully established in South Australia. Other species in the first plantings were Maritime pine (*Pinus pinaster),* Aleppo Pine (*Pinus halepensis),* Stone pine (*Pinus pinea)* and South Australian Golden wattle (*Acacia pycnantha).* All were planted into unprepared sand dunes and left to see if they would grow. Not surprisingly they were a complete failure.

Trials continued mainly at Hamel and at Ludlow, a few kilometers north of Busselton. Gradually, with more careful site preparation some successes were achieved with *Pinus radiata* and *Pinus pinaster*. In the next few years there was more test planting, again with several species of pine and Golden Wattle, mainly at Hamel and Ludlow, e.g.

1903 7acres of mixed pine and wattle
1904 17 acres
1905 70 acres at Hamel
1906 100 acres at Hamel
1907 unknown at Hamel
1908 unknown at Hamel and Ludlow
1909 unknown at Ludlow
1920 70 acres at Ludlow

By about 1920 foresters, believed they had enough technical skill and knowledge to mount the first serious attempt to establish a forest of pines in 1922. The site was on previously cleared farmland about 3 kilometers upstream from the Mundaring Weir wall. Approximately 8 hectares were planted to rehabilitate the site, with *Pinus radiata* stock raised on site in a small nursery. Early growth on this small compartment was very vigorous and so small planting programmes began in several areas where forestry staff was stationed.

By the beginning of the 1930s regular pine planting was underway in most of the high rainfall areas under the control of the Forests Department, especially near Perth using labor from those unemployed by the Great Depression, but funds were not available to greatly expand the programme. It was not until the late1950s that funds were made available under the Commonwealth Government (the Softwood Forests Agreement Act) to greatly expand the Nation's pine planting programmes. At this stage in WA, under the Forests Act, the Department began the purchase of cleared farmland with suitable soils, mainly in the Blackwood Valley to boost the area of *Pinus radiata.* These programmes went fairly well for about a decade, but by then Government funds were getting tighter, and the community values of farm versus forest were becoming the center of heated debate This, in turn, caused the introduction of limits on clearing, restricted the use of chemicals in site preparation, and ultimately the ban on clearing native vegetation to plant pine.

By the year 2000, Western Australia had some 60 140 hectares of pine plantation on land owned by the State, and a further 23 480 hectares on share-farming land, which together could yield up to 330 000 cubic metres of mill logs and 295 000 cubic metres of other products (e.g. posts, rails, particleboard logs etc.) per annum. This resource is supplemented by substantial plantings on private land.

This period was a time of great innovation. Initially little was known about soil nutrients or mycorrhizal fungi, and the need to arrange inoculation of the nursery soils. Critically important work on soil minor elements such as Zinc was done by Dr T N Stoate and on nutrition with rock and super-phosphate and foliar analysis by A Hatch. The earliest seed sources of *Pinus pinaster* came from South Africa and were large-limbed, of poor form and with slow growth rates. A major tree-breeding programme developed by R H Perry, E R Hopkins and A Malaczjuk during the 1960s, selected "*plus*" trees from Portugal, France and local plantations. Seed orchards were established and major improvements achieved. Pine planting machines were built locally and techniques for harvesting water in coastal sandy soils, such as furrow-lining were developed.

2 SELECTION OF TREES FOR REMOVAL

The established plantation has around 800 trees per acre (or about 2000 per hectare). The overall management of pine plantations is planned as a series of thinnings to progressively reduce the number of trees left behind for final clear-felling at the end of the rotation, initially set in Western Australia at about 50 years of age. There were usually 3 or 4 thinnings, beginning at age 12 to 15 years. The final decision to thin a particular section of plantation depended on the levels of demand at that time for the estimated produce from the thinning. Most trees removed at the first thinning are quite small with butt end diameters of not more than 50 cm and the upper or smaller end of the logs of about a 10cm diameter.

The primary focus of all early thinnings in WA plantations was to reduce the number of trees per hectare as early as possible to reduce drought deaths and to obtain large logs as quickly as it was feasible. However there is also an imperative to make the thinning a commercial success. These differing objectives may not always be achievable. The real problem is one of cost without economic return. Slowing growth rates followed by drought deaths pushed the decision towards acceptance of non-commercial thinning, as proposed in "Silviculture 70". This was the last in a series of silvicultural methods developed to find the simplest but most efficient way to thin young pine forests.

3 FELLING

The first pine logs were sold in 1927/28 and they were cut at Hamel and Ludlow. Records are limited, but it can be assumed they were felled with crosscut saws, trimmed with axes and cut to length with the same saws. When felling of pine logs began, their small size was a cause for embarrassment among the workers involved, who were much more at ease with felling large jarrah and karri (*Eucalyptus diversicolor*) trees. When Mundaring began supplying small case-logs to a Departmental mill at Gnangara they were described as *"Nannies"* and the youngest worker on this job (Robert Thompson) was known as the best *"Nanny Stacker"* in the business.

Early pine logging was carried out by Forests Department day-work gangs using equipment that was available in the district. These men had access to 2-man crosscut saws and the ever-ready 4.5 pound axe "The Kelly", all that was needed to cut the small quantities being harvested. During World War II cross-cut saws were gradually phased out in favour of the one-man Bowsaw which was 2 ft 6 inches long. By 1950 practically all pine logging throughout Australia was being done with these Bowsaws. They were cheap, fast cutting and could be sharpened by the operator, who carried with him a tin of kerosene to clean the blades.

At about this time the nature of day-work labour had also changed, mainly by the influx of migrant labour, keen to make an impact on the scene. As the volume of logs increased the opportunity arose to offer fallers piecework rates for cutting and assisting to load. Some of these operators became highly efficient and when the Australian Workers Union demanded a Board of Reference inquiry to demonstrate that the Forests Department was making life difficult for piece-workers to make a decent living, some of these "*Gun*" fallers happily demonstrated how easy it was for them to earn more than the Award Wage.

In 1955 a Mall and a Bluestreak chain-saw was bought for $300 and tested in pine at Mundaring. In October of that year two British Danarm saws were also tested. These machines were very heavy and had a primitive carburettor which meant the blade (cutter bar) had to be rotated 90 degrees from felling to cross cutting. They also had the primitive "scratch chain", that were inefficient and difficult to maintain.

In 1957-58 the first North American chain-saws hit the WA market like the McCulloch models 043A, which had a geared drive, and 073A with direct drive. They were adopted as a standard and were ordered in bulk, for example like the 40 or 50 ordered to combat the Dwellingup fires of 1961. They were still quite heavy but were reliable and came equipped with the superior "chipper chain". Other brands soon became available, e.g. Homelite and less known types from the USA and

Europe. Dealership changes and the arrival in WA of the lighter and more efficient STIHL from Scandinavia in the early 1960s resulted in a swing away from the North American types.

In late 1977 the John Deere JD743 Tree harvester was trialed extensively at Grimwade. This harvester shear felled trees then delimbed them. It could not however selectively dock to length, but was admirably suited to first thinning (T1) operations for particleboard logs although it did have some difficulty with larger limbs on fast grown *Pinus radiata*.

These days, felling is done by machines that fall and delimb each tree, and then cut it into predetermined lengths and quality classes.

4 EXTRACTION

Initially, the smaller logs were loaded by hand, but by the 1940s the bigger logs were too heavy to load by hand and so use was made of horses to drag the logs out of the plantation, sometimes with the use of sleds. When World War II ended, a large number of Army surplus vehicles became available by public auction, and many were purchased quite cheaply by logging contractors, and by the Forests Department for use as gang transport and heavy-duty water tankers. These disposal trucks were generally known as "*Blitz Buggies*", and were mainly Chevrolets or Fords, many of them having four-wheel drive.

By 1956 or 57 the Forests Department Plant Engineer (T J Welch) had designed and fabricated the workshop cranes and then several "*Jib cranes*" on the cab and chassis of 3 ton capacity Chevrolet trucks. These cranes were used widely in pine logging, initially at Mundaring and later at Gnangara and Harvey to extract logs from the plantation and to load haulier's trucks. With skilled operators the "*jib cranes*" did a marvellous job for a decade or so, but were eventually replaced in the Northern and coastal plantations by the first purpose-built logging tractor to be brought into Australia, the Massey Ferguson Treever.

The Treever, a short-wood forwarder, was brought to Australia by the Commonwealth Government's logging research unit managed by C M (Bill) Kerruish in 1968, and was the center of interest for foresters and loggers from all over Australia at a logging seminar in Canberra in 1969. Observers from WA were very impressed with what they saw in Canberra and the Forests Department purchased their first Treever in 1969 for $15 000, and bought it's next machine for $16,000 in 1972. They were not an answer to all the problems but after a slow introduction they were well suited to the flat terrain of the coastal plantations but under-powered for use in the Hills forests. The log length they could extract was limited to under 3 metres, and this required some modifications in the Forests Department workshops. So the search continued for more suitable machines and this lead to trials with the Volvo.

Two Volvos were obtained by the Forests Department, a model SM 462 for $26 711 in the Capital Budget of 1974 and a model TC 860F leased in April 1980 since the State Treasury would not allocate funds for a purchase price of $93 046. These machines were obtained because of difficulties in supply of spare parts for the Treevers, and because logs were getting too big for them to handle. There was initially little interest among the existing logging contractors because the expense of his type of equipment and the relatively low volumes available. The introduction of larger machinery into the plantations was greatly assisted by the implementation of a fifth-row extraction system.

The Volvos were not as efficient as the Treevers on the coastal plantations being less maneuverable and slower, but they out-performed them in heavier going at Harvey, Ludlow and Grimwade. There were maintenance problems with the larger Volvo and the Department was pleased to transfer the lease to Palmer Pine Hauliers who won the first large scale integrated logging contract for the Northern Forest Region early in 1981.

R&N Palmer progressively tested a range of imported equipment such as the small hardwood skidders and the Canadian Timber-Jack in operations at Grimwade and then at Nannup in 1970. In 1974 they tested the first Kockum forwarder at Grimwade. This was a very powerful machine capable of forwarding long logs with up to 16 tonne payloads. Despite some Forests Department

misgivings about the size, trials were deemed successful, and a second Kockum was obtained in 1975. Because these Kockums were much more expensive, at a cost of some $200 000 in 1976, leasing found to be an alternative way to finance them.

The OSA 260 Logger was tested for the first time in Australia at Bussell Plantation, Collie in January 1983. It gave a very impressive performance, and when fitted with wider wheels it performed well on soft ground. At a price of $207 000 it was comparable with the Kockums, and by January 1983 the contractor had nine Kockums and two OSA's on the pine logging contract, and the costs were kept within limits by working double shifts. These days, the cut logs are still extracted to roadside by powerful Forwarders.

In the steeper valleys around Nannup, extraction by high lead was used successfully, in combination with the fifth-row extraction system.

5 HAULING

Initially, the logs were loaded onto a horse-drawn wagon for delivery to a nearby sawmill or loaded onto rail for haulage to an existing hardwood mill. They would have been small logs cut into fairly short lengths, and a few years later when motorised transport was better established, the length was limited to 8 feet. The first pine logs to be carted by motor truck were taken from Hamel in 1935.

As the volumes and number of buyers increased, so also did the demand for haulage trucks. Initially their usage was quite irregular, and so complex contracts were not required. Instead, informal arrangements were made with interested parties in the various districts. Relevant prices were negotiated and newcomers entering the trade were happy to accept the negotiated prices. The first informal contracts were prepared in the period just after the end of World War II the first being for carting logs from Mundaring to the Perth Metropolitan area. This system worked quite well up to the end of the 1950s and was really like a family affair. After 1960 the volume of pine produced increased very rapidly, and more formal contracts were needed.

As trucks became more powerful with bigger payloads, the unit cost of transport decreased allowing longer economic haul distances and benefiting the amalgamation of intake from smaller mills.

6 PRODUCTS

6.1 *Particleboard*

There were many and varied estimates of the supply of logs needed by the particleboard factories built by Wesfi between 1964 and 1976. This was, in large part, due to the need for Wesfi to sell up to 75% of it's output into the Eastern States market, already well catered for by Eastern States manufacturers. In addition, as their expertise increased they were making a variety of particleboard, varying in thickness, size of sheets, and waterproof. For example they estimated that after mid-1967 the combined intake of Carlisle and Kewdale particleboard plants would be only 14 000 cubic metres but in November 1964 they predicted that the maximum for the two plants combined was 60 000 cubic metres per year. With this level of intake the existing contractor couldn't generate finance for the rapid expansion of loading and haulage equipment required.

It was also apparent that the supply of particleboard logs from Mundaring and the Coastal plantations at Gnangara would not be able to keep up with the rapidly growing demand, and that the Department would have to draw on the Central and Southern regions for supply.

The development push received a major stimulus when, in mid 1976, the big Wesfi Particleboard plant at Picton (near Bunbury) opened with a proposed first year intake of 50 000 cubic metres rising to 150 000 by year 6. The construction of this factory was very important for the Forests Department in bringing forward the first thinnings for plantations in the Central and Southern Regions. The first thinnings produced no sawlogs and even the second thinning produced fewer sawlogs than some forecasts

When both large mills and the Dardanup Particleboard plant were in operation there was a huge increase in the volume of pine logs being cut and hauled to these centers. It was a complex situation with several different types of log being delivered to these three buyers. The stockpile problem with pine of blue-stain was overcome by under-water- spray storage, which was built at the respective plants and was very successful.

6.2 *Sawlogs*

Among the early buyers of sawlogs were HD &F Simper of Fremantle, A H Baldock of Bunbury, and City Case Factory in Perth. In 1929 City Case bought 350 tons (357 tonnes) from Hamel, while Baldock of Bunbury obtained 60 tons (60.96 tonnes).

For a number of years the Forests Department was engaged in a small way in running it's own mills at Ludlow 1947/48, Grimwade 1949/50, Keenan 1950, Pimelia 1954/55 and Harvey 1957. All were too small to be economic, but were built to commence thinning operations and to build a market for the growing resource. They also filled a need to determine a value of sawlogs at the stump (stumpage) and helped to supply sawn pine boards at other than case mill sizes from these small and scattered plantations. During the years 1959 to 1969, the plantation area doubled and the production tripled, to just under 80 000 cubic metres per annum.

Jim Banfield's case mill at Mundaring burnt down in 1959 and he decided to re-build in Perth. His new mill, known as City Case was built in Roberts Road, Osborne Park in 1960, and was much larger than his earlier mills. It was still fairly orthodox but incorporated intake skids which could handle several days' supply of logs, and speeded up the turn round time for the cross-loaded trucks. At the same time smaller buyers in the Metropolitan area were increasing the throughput of their mills and getting into the cheaper part of the furniture trade and the total demand rapidly increased. The combined intake for all case mills reached 15 000 loads (20 250 cubic metres) in 1963.

After much discussion it was decided in 1974 to carry out a survey to establish the volume of saw logs which could supply a single large mill near Bunbury. A task force set out to conduct this survey and reported early in 1976 that two mills with capacities of 25 000 cubic metres per annum could be supplied from the southern region from 1978 to 1983, and could increase their intake to 50 000 cubic metres each in 1984-85, with a further mill of 50 000 cubic metres capacity possible from 1986.

The information about the on-coming volume of quality pine sawlogs was followed by the evolution of two major players who collectively represented most of the established and experienced sawmillers in the State. The two companies were Softwood Products, and Wharncliffe. Neither had solid experience in pine sawmilling.

Wharncliffe purchased the Forests Department mill at Margaret River in 1978, with an initial intake of 10 000 cubic metres of case logs, and 50 000 cubic metres of sawlogs over 20cm diameter at the small end, and thereafter at a new mill to be built at Dardanup by 1981, at the same level of log supply.

Softwood Products WA Pty. Ltd. took over operating the Department's Grimwade mill in 1978, with an intake of 8 000 cubic metres of pine saw logs per annum until it built a new mill to operate from 1984-85 at an intake of 50 000 cubic metres per annum.

Agreement was reached with the two companies in March 1978, but on April 4th of that year Cyclone Alby savaged the plantations in the Central Region and necessitated substantial renegotiation of the volumes to be supplied and their timing.

6.3 *Medium Density Fibreboard*

Medium density fibreboard MDF is a product with a much finer grade than particleboard. It can be used in many parts of a building such as moldings and architraves, where it needs very little paint to provide a smooth finish. Wesfi advised the Forests Department in December 1983 of its intention to build an MDF plant in the northern forest or at Kewdale. This announcement initially caused some concern over the availability of logs to meet this new demand but by mid-year it was estimated that there would be enough small logs to meet the demand.

In September 1985 Wesfi confirmed their decision to convert the existing Kewdale factory from particleboard to MDF, aiming to start production in mid 1987. This would require an intake of 40 to 50 000 cubic metres per year. The medium density fibreboard factory began operations in September 1990 with an intake of 41 000 cubic metres per year but by November 1991 the target was raised to 100 000 cubic metres, to include regrowth hardwood, mainly marri (*Corymbia calophylla*) and bluegum (*Eucalyptus globulus*). After considerable dialogue between Wesfi and CALM it was confirmed that all deliveries to the MDF plant would be weighed and bin measured.

6.4 *Laminated Veneer Lumber*

Recently, the Government and Wesbeem concluded an agreement whereby Wesbeem would build an $85 million laminated veneer lumber factory near Perth and the State would supply 4.1 million cubic metres of pine to this plant over the next 25 years, at an average of about 160 000 cubic metres a year.

7 LOG MEASUREMENT

Western Australia developed a unique system of log volume measurement. The main unit was the "*load*" which was a true volume of 50 cubic feet, 600 super feet or 1.35 cubic metres. Volume tables for pine species were also developed. Later, a "*bin*" measurement was introduced, based on the length, breadth and height of loading on a truck, and with an estimate of the volume of this space actually occupied by the logs. This method of measurement became quite critical when dealing with small particleboard logs because in the absence of a weighbridge measurement of individual logs was very costly.

Some early attempts to use weight instead of bin measure were also made but was complicated because the Specific Gravity of pine logs varied greatly depending on the rate of drying between the time of felling and the time of delivery to the factory. It also varies between species and seasons. Eventually, this also became an accepted technique, by applying appropriate conversion factors.

8 SAFETY

Some of the Forests Department Detailed Annual Reports include a fairly exhaustive list of accidents in the timber industry, with emphasis on sawmills, but there have also been many accidents in the pine industry, most of them connected to the felling, snigging and loading functions. In the days before mechanical loading and chain-saws, most of the accidents were with axes and faller's back pains the latter being caused by the manual loading of haulier's trucks. (It was noticeable that the best and most consistent cutters were the least prone to accidents, while the slower, less successful fallers were more likely to have an accident.)

With the advent of chain-saws there were two main classes of accident; viz. back or leg injuries and outbreaks of Raynaud's Syndrome (or "*White Finger*"). The former was generally overcome by improved training of operators in the correct ways of lifting, but Raynaud's Syndrome was a more difficult problem. It caused severe pain in the fingers of both hands accompanied by a slow flow of blood to the fingertips, hence the alternate name of "*White Finger*". It appeared to be caused by high frequency vibrations in the chain-saw's handlebar, especially the high performance European saws, deadening the nerve ends of the finger. The problem persisted for about 2 years, when with changes to the length of time per day the operator worked the saw, and with some design improvements by the manufacturers to reduce the high frequency vibration, the problem has seldom surfaced since.

Other changes in chain-saw operations included the use of hearing protection, and the wearing of protective clothing, safety boots and helmet, face visors and leather aprons or padded trousers.

With respect to snigging and loading, the advent of crane trucks, forwarders and mechanical loggers has greatly reduced the incidence of accidents.

9 CONCLUSION

In the 100 years since the first plantings of pines began in Western Australia, there have been many innovations and developments in the establishment and silvicultural practices, the logging and the processing of the important economic plantations that resulted from these humble beginnings.

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