SESSION 4

Paper (b)

HARVESTING THE EASY TERRAIN
Logging operations Kaingaroa Forest in the 1980's and progress from the 1950's

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INTRODUCTION

This paper is confined to looking at clear felling P. radiata at Kaingaroa Forest by "State" operations. It explores what has developed over the period 1950-1983 in an endeavour to gain perspective for future research and development. To obtain proper comparisons without having to become involved in productivity calculations the data has been confined to the so called "single units" in a "hot deck" situation consisting of a prime mover, stacker-loader, chainsaws, men and some minor ancillary equipment, with a minimum of log storage. These are the only units common over this time span.

The basis of comparison used in the paper is production per annum in cubic metres for the following reasons:-

(1) Cubic metres (m^3) is near enough to the same thing as tonnes for those who think in tonnes particularly with the product under discussion.

(2) The means of measuring logs are not that precise, particularly in smaller quantities i.e. close to the stump.

(3) Daily production has little meaning in logging as it can double or halve itself for no apparent reason other than a good or a bad day.

(4) The product is relatively stable, also there are quite good storage facilities along the production chain which cope with the quite low annual climatical variations. The utilisation plants using the material are therefore not too concerned on a daily basis provided there isn't a shortage. To even out variations annual data has been used.

(5) Production per man hour while important in cost terms is about as stable for comparison purposes as the unit it is based on, the man's not particularly consistant day to day along with our skill in measuring logs in these relatively small units.

(6) Costs per cubic metre are not reliable when digging into past records and tend to take on a sensitivity far beyond their real value as a comparison media. If they are high the sooner forgotten the better, if low we are not allowed to forget them.

(7) Inflation and its manipulation makes comparison in cost terms between different years almost meaningless, as there is very little documented work within the logging industry to give guide lines.

The above factors perhaps give the first clues to future research and development.

THE 1980'S

A series of slides is to be shown demonstrating the present clear felling equipment and systems. No haulers have been included as steep country is covered elsewhere in the Seminar.

CHAINSAWS

Single man saws exclusively used, between 40 and 100 cc rating with a trend towards the smaller saws. Noise and vibration dampening commonplace but not yet universal. Automatic chain breaks along with protecting clothing and equipment are starting to be used. Directional felling extras plus the labour and strain saving techniques recently introduced are used occasionally.

EXTRACTION EQUIPMENT

The skidder in the kilowatt range 100-150 is the most popular with the odd grapple attachment showing up. Conventional tractors and rubber tyred arches still in use, mostly between 80 and 150 kilowatts, a few bigger still in evidence. Some of the newer FMC's showing up with 150 kilowatt power units. All the above are notable for improved driver comfort, ease of operation and extensive use of oil hydraulics. The tractor is still an adaption from other uses but quite well achieved with a good arch. The other two are built for logging exclusively and other than beefing up a bit to meet the local conditions are entirely conceived and built overseas, but assembled in N.Z.

LOADING AND STACKING EQUIPMENT

Some jib cranes with grapples still used but front end articulated loaders most common. To be able to unload truck trailers and lift some of the present day logs, 90 to 120 kilowatt machines are used though some bigger sizes do make an appearance. The latest hydraulic crane type tracked loader has appeared but hasn't found a permanent berth in any numbers.

MANPOWER

Where cutting patterns and log segregations are simple man power per production unit can be as low as 6 but with non full time working owner/operators and supervisors taken into consideration the numbers average 7 or 8 men. However where cutting patterns get more complex and additional men are being trained the numbers get up to 10 and 11 or higher.

Other than having long hair this man is mostly the same. He has two arms and two legs and goes home at night. He does however generally have a longer association with logging. Some are fourth and fifth generation bush workers. This is being dealt with in greater detail by another contributor who has far more knowledge than this speaker. There is therefore little else to add.

GENERAL COMMENTS

(1) The length of haul and/or roading density appears to be similar as in the past, 140-150 metres (8 chains).

(2) The number of support men and equipment appears greater, mechanics, fuel trucks, rope works, planners, time study, to name a few.

(3) Planning and layout doesn't appear to have changed very much, probably more personnel involved but still not enough predictive work done. Probably far more outsiders drifting about the landings measuring logs and time.

(4) The tree size is bigger particularly with the advent of some of the 57 year old thinned stands. An average is 4.3 m^3. The thinned stands go as high as 6.7 m^3 merchantable. However there are still some stands which have very poor tree form and low uneven stocking. The merchantable increment has not improved as much on these stands. The volume increases but it is spread over a greater number of merchantable limbs and leaders.

(5) Contract form of payment is used, interestingly in two different ways. Straight contract for the whole job on prepared landings in $ per tonne and also contracting for the hire of equipment working within a company crew, paid in $ per hour.

(6) Though not within the scope of this paper double logging units have evolved. They are better able to withstand the pressures of supply against machine and man power breakdowns. Early writings indicate that they are economically feasible, the more so with larger tree sizes, but today their production is seldom if ever double that of single units. They are however far less stressfull with a changing supply demand, being able to meet peaks in demands and recover more quickly from quiet periods. Manpower is reduced in a double unit.

METHODS IN THE 1980'S

Basically unchanged from earlier times. Trees are felled ahead, both for top and butt hauling, there is little directional felling, only some heading off, and a minimum of trimming carried out in bush. The "tractor driver" mostly does the stropping, particularly in the smaller crews. Logs are finally trimmed, marked and cut up on the skids and then either stacked according to product type or loaded directly on to trucks.

These operations represent between 65% and 75% of the present cut by volume despite thinnings and other species. This is likely to remain the same for some time except for the advent of smaller tree size from the second rotation. It will take some time for the newly planted stands to significantly alter the terrain balance as the second rotation begins to be felled.

WHAT DEVELOPMENT HAS TAKEN PLACE BETWEEN 1950 and 1980

(1) Production for single units has increased from 35 000 m^3 in 1950 to in one isolated case 129 700 m^3 in 1981, a 271% improvement. However this figure is one crew only working in very high tree size (6.2 m^3 merch). The average for the group of crews is 82 600 m^3 with a mean tree size of 4.3 m^3 or 66 900 m^3 with a tree size 3.7 m^3 excluding the group with the very high tree size. In 1982 windblow occurred and there was no extra large tree size clearfelled. Their rate of production excluding windthrow was 71 400 m^3 with a tree size of 4.3 m^3.

The increase in production for a group of crews therefore is from 35 000 m^3 to 82 600 m^3 with inclusion of the extra large trees or probably more fairly 71 400 m^3 without those trees. A 136% or 104% increase respectively. This group is on contract and started operations in 1973, have been allowed open ended production and are not directly associated with a utilisation plant.

A second group of single unit crews, this time associated with a utilisation plant have moved from the 35 000 m^3 in 1950 to 72 000 m^3 in 1981, a 106% improvement. Unfortunately the 1981 data includes an ill-defined period in extra large trees and some mixing though not extensive with double units. The data across the time span is sparse but shows a definite increase to 46 400 m^3 in 1968 with a potential of around 61 000 m^3 being quote at that time. In fact 61 004 m^3 was achieved in 1970 and this level has remained relatively steady till the bigger trees influenced production in 1981. The increase between 1967 and 1970 I am told, was associated with the start of export of logs and re-equipping with new cranes and tractors. The drops have been almost exclusively caused by a downturn in demand.

It is also significant that this last group have to contend with some very poor stands which are low stocked and badly malformed. No merchantable tree size data has been kept. The above data is shown in graph form in the appendix.

(2) From the above it is obvious that merchantable tree size has increased. The best estimate is from 1.6 m^3 in 1950 to 4.3 m^3 in 1982 a 169% increase. A graph is attached which demonstrates the movement in tree size and gives some explanations as to this movement using the Kaingaroa growth model as a basis. The sirex epidemic of 1946 to 1950 and its effects has influenced the stocking and resultant trees size significantly and totally confused research into the stand condition at time of logging in 1950-1960.

To demonstrate the significance of tree size to logging production a graph is attached. Taking the established tree sizes of 1.6 m^3 and 4.3 m^3 this would indicate that production should have risen from 41 900 m^3 to 73 700 m^3 or improved 76% from tree size alone over the period in question. As no tree size data is available for the second group of crews mentioned in the production paragraph above, the quoted 76% is probably an overstatement, certainly so for the poor compartments.

(3) Machine size and kilowatts have certainly increased, also the layout, comfort and productive extras have greatly improved. One of the most significant is the use of oil hydraulics for controls. The emergence of machinery built entirely for logging has also given a much higher production capacity. Unfortunately no data could be found to substantiate or document this gain. However there is plenty of evidence which shows the negative results of having machinery too big for the job. It is felt bigger machinery can take advantage of bigger trees but are of little or no value unless associated with other factors which utilizes the extra power. The extra speed which machines nowadays have has not shown up to any extent in increases in haul length and the associated saving in roading density. Perhaps it hasn't been necessary to look or we haven't the skills?

(4) Machine reliability has improved, but it is questionable if this is not the result of a lower average machine age rather than any intrinsic improvement in machine quality. Some groups replace far more often than other groups, so perhaps this is rather associated with the form of payment. There has been a very large improvement in the servicing of logging crews, fuel, repairs, and services generally are very much more in evidence in the 1980's but may only reflect again the move towards contractors and involvement of the wider community. Methods have not significantly altered, we still separately fell, haul and cut up with little or no consideration to the interaction between these phrases of extraction. There is plenty which could be researched in this area but one suspects that the gains from tree size have made any development work not necessary. The grapple is one development working well. Also chainsaws and

rubber-tyred fleeter-loaders have changed the scene, probably manifesting themselves as method changes in the form of double units. Unfortunately there isn't hard evidence which documents these gains.

(6) Manpower. The numbers in the crews of the good gangs have dropped but the numbers supporting the crews seemed to have increased. There is plenty of documented evidence showing greater man hour production figures but one wonders if this is really just a desk exercise as there appears to be plenty of people in evidence round the landings in the 1980's.

(7) Utilisation plant restrictions and export down turns have contributed mostly to the low production years.

COMMENT

Gains there have been, they look impressive, 136% since extensive exotic logging started. This represents plus 4.3% on average per year but really is only approximately a 2.5% increase per annum as it should be compounded. If the value which tree size has contributed is extracted from this production, other forms of improvement have contributed near 34% or compounded, under 1%.

The point is its not much, so there is still plenty of room for improvement.

It must be remembered the data comes from Kaingaroa which has these advantages:-

1. The longest exotic logging traditions which evolved directly from indigenous logging, there are now fourth and fifth generation workers and managers.

2. Some of the easiest topography and logging conditions associated with high quality forest.

3. There has been industrial competition, i.e. Kaingaroa Logging Comapny, Forest Products and Fletchers.

4. Industrial Engineers and others have been about the place since 1955 documenting and consolidating the knowledge of what is possible.

5. Quite large scale training has been and is available.

6. There has been other than a few short periods an expanding demand in large scale operations leaving plenty of room for improvement.

7. There has developed a well organised back up service from the larger community.

Research seems the only way to lead any future development particularly in areas without the above advantages. It appears a lack of understanding and acknowledgement of the potential is still the greatest barrier.

AREA OF RESEARCH IN THE FUTURE

In gathering the data within this paper on "Harvesting the Easy Terrain" the following areas of research and development have presented themselves. In the total logging scene there are far more not listed.

1. Tree size, its distribution and variability within the stand.

2. Techniques, for evaluating the input variables which are likely to have effect in the logging field, enabling the evaluation of reasons for the production variability of:-

   Machinery; Man; Tree size; Haul distance; Roading density; Demand; Learning curve; Motivation

3. Development of logging systems.

4. Study and documentation of inflation within the industry, so meaningful productivity studies can be attempted.

5. Some simple means of measuring logs close to the stump.

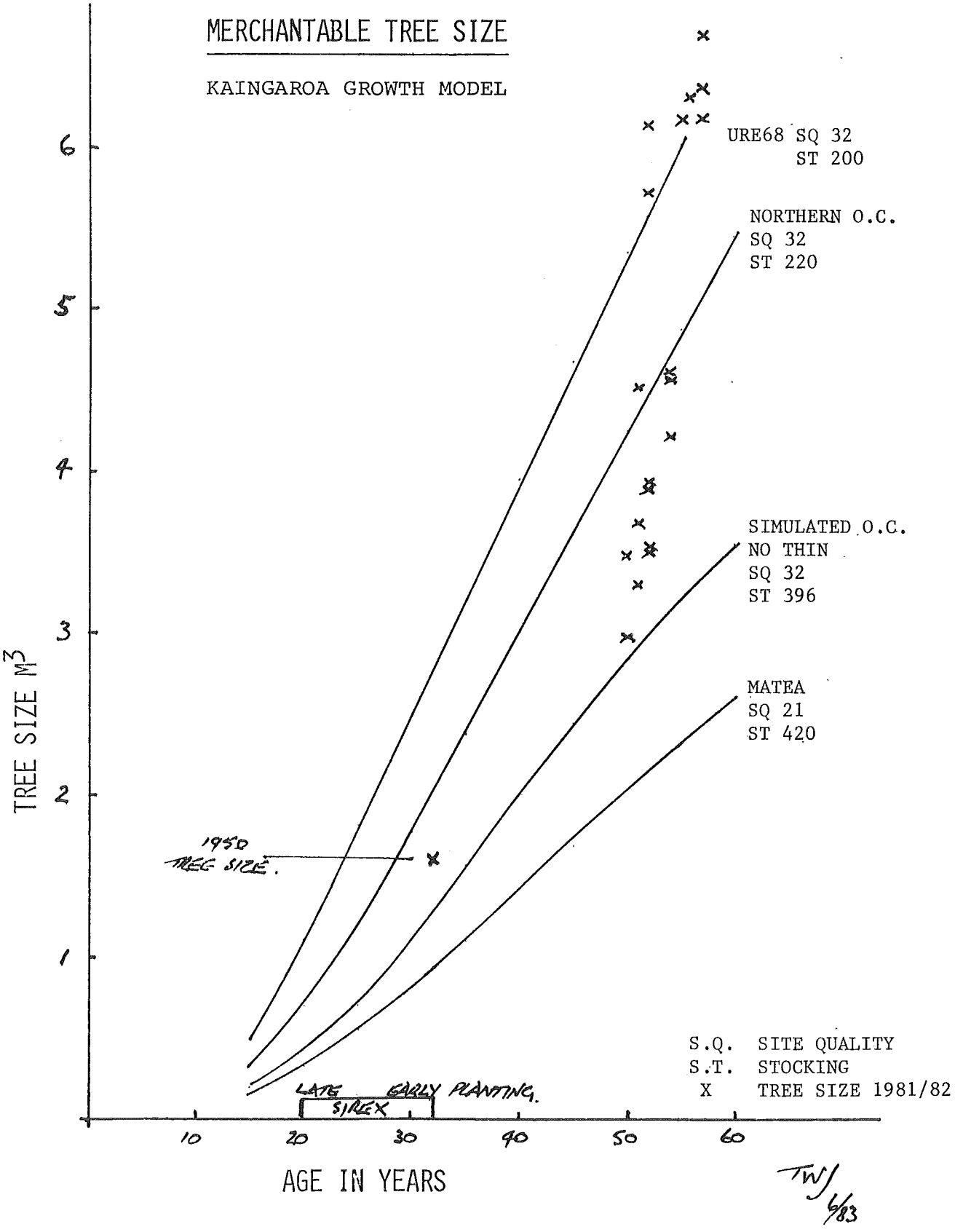
6. Planning and layout technology required, then published and the skills developed for every day use preferably right up front with the operational crews.

REFERENCES

Proceedings of Logging Machinery Seminar LIRA 1982.

NZFS Unpublished Reports

1. Annual Logging and Production Survey
2. Production and performance returns Kaingaroa


MERCHANTABLE TREE SIZE
KAINGAROA GROWTH MODEL
URE68 SQ 32
ST 200
NORTHERN O.C.
SQ 32
ST 220
SIMULATED O.C.
NO THIN
SQ 32
ST 396
MATEA
SQ 21
ST 420
1950
TREE SIZE.
LATE
EARLY PLANTING.
SIREX
S.Q. SITE QUALITY
S.T. STOCKING
X TREE SIZE 1981/82
TREE SIZE M3
AGE IN YEARS
1
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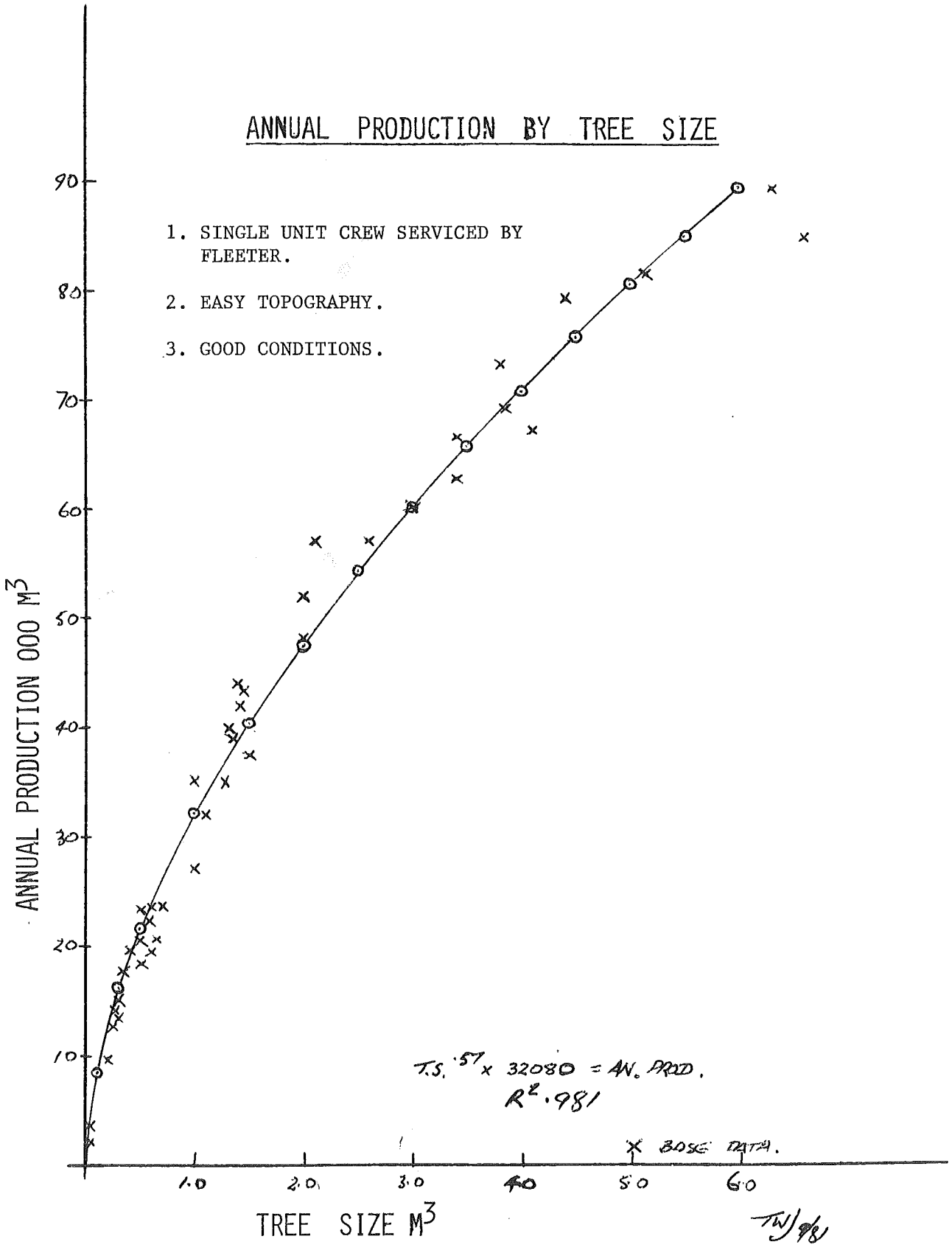
TW/
6/83


ANNUAL PRODUCTION BY TREE SIZE
1. SINGLE UNIT CREW SERVICED BY FLEETER.
2. EASY TOPOGRAPHY.
3. GOOD CONDITIONS.
ANNUAL PRODUCTION 000 M3
TREE SIZE M3
90
80
70
60
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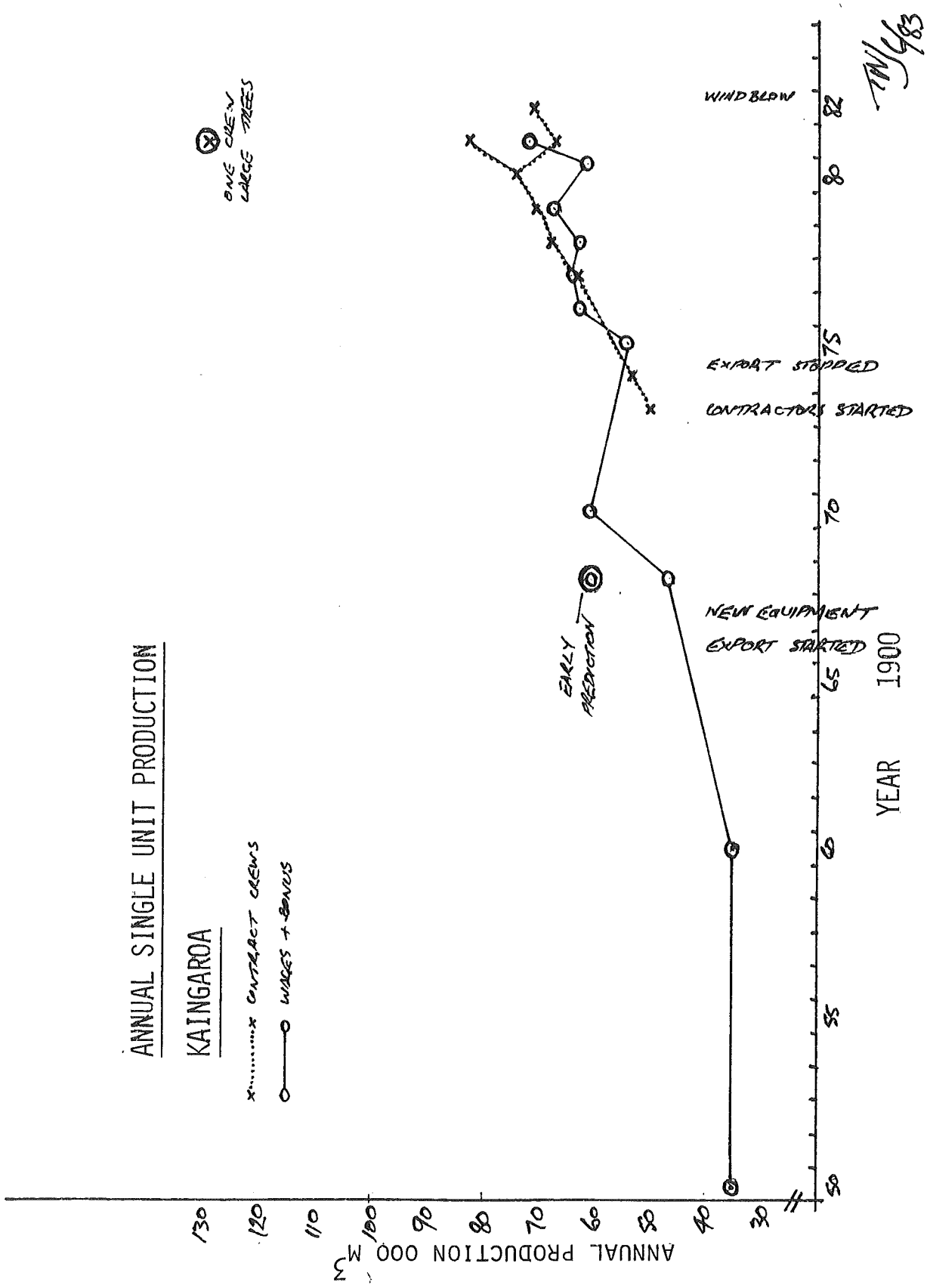
ANNUAL SINGLE UNIT PRODUCTION
KAINGAROA
CONTRACT CREWS
WAGES + BONUS
ONE CREW LARGE TREES
EARLY FELLING
NEW EQUIPMENT EXPORT STARTED
EXPORT STOPPED
CONTRACTORS STARTED
WINDBLOW
ANNUAL PRODUCTION 000 M3
YEAR 1900
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