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# THE MEASUREMENT of LOGS and METHODS of STATING THEIR VOLUME

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# THE MEASUREMENT OF LOGS AND METHODS OF STATING THEIR VOLUMES

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Although various Empire and Commonwealth conferences have urged the adoption of cubic measure for logs, there is still a marked reluctance or lethargy in Forest Departments and saw-milling organisations which has prevented any significant advance being made.

Before discussing present systems and practices, it is proposed to mention briefly the basic reasons for measuring logs, what we need in a system of log measurement and how we may approach the problem of measurement.

## REASONS FOR MEASURING LOGS

These can be considered as falling into two broad and not unrelated groups:-

(A) For Accounting -

- Stumpage
- Felling contracts
- Hauling contracts
- Milling contracts
- Customs duties

(B) For Management and Research -

- Silviculture
- Utilisation
- Forest Management
- State and National economics studies

The desirability of using the same unit of measurement for all accounting purposes will be obvious and it will be appreciated that, if the widest possible benefits are to be obtained from research, it is essential that data and reports prepared in one State or country should be readily understood by people elsewhere.

WHAT WE NEED IN LOG MEASUREMENT

The basic requirements in a system of log measurement can be listed as follows:-

Reasonable accuracy;
Fairness to all parties;
Applicability to all types of utilisation;
The same units for research as for industry;
Simple field measurements for computing volumes;
Simple field estimation of volumes;
Comparability between States and countries;
A unit large enough to prevent totals becoming astronomically great but small enough to ensure that there will be at least one whole unit in a small log.

Since most of the reasons why we need these characteristics and the disadvantages of not having them will be apparent, it is not proposed to enlarge on them here. Let us move on to consider systems for measuring logs.

APPROACHES TO LOG MEASUREMENT

These are of two basic types:-

(A) Recovery approach; and

(B) true volume approach.

In the recovery approach, an attempt is made to assess the number of units of a particular product that a log will yield when manufactured into that product. In the books of account the log is recorded, not by its fundamental dimensions, although these will have been obtained and may be shown, but by the number of units it might yield.

This conception has attained its greatest development in U.S.A. where some four hundred log "scales" are in use or have been used. All purport to show the number of super feet of timber that will be sawn out of logs of various sizes, and all of them are incorrect. They are incorrect because of a host of factors that it would be a waste of time for us to consider, but you have all heard of overruns and underruns on Scribner and Doyle scales etc. A knowledge of the average quantity of timber of a particular range of sections that can be sawn out of sound, straight logs of different diameters and lengths is most important in mill design and mill management but it is not a good starting point for commercial accounting or fundamental forest research.

The question now arises "Is the Hoppus system a recovery approach?" I cannot vouch for the truth of this story but it seems to carry an element of reason. Hand squared, and therefore slightly irregular, logs imported into England years ago were tallied by girthing and then squaring the quarter girth. This was quite a sound method but some person, presumably Hoppus, applied the same method to round logs claiming that the extra volume in the round log was approximately what would be lost as waste in sawing. If this story has any truth in it, the Hoppus system started as a recovery system. Unlike most of the American log rules, Hoppus, irrespective of log diameter, gives a fixed proportion of true volume. I prefer, therefore, to regard Hoppus, Matheson and Haakon Dahl (they are all the same) as a true volume system in which a constant factor TT/4 (78.54%) is applied to achieve the result. If we agree on this, why not use true volume and avoid the time and trouble of a further - quite irrelevant - calculation.

TRUE VOLUME APPROACH

As the name implies, in this approach a log is recorded in the books of account by its actual volume. Theoretically, but because of practical difficulties of measurement not actually, this volume is the one that would be obtained by plugging any holes there might be in the log, immersing it in water and measuring the volume of water displaced. The effect of taking the plugs out of the holes will be considered later.

The log volume units used in Australia are:-

(a) Cubic Foot

(b) Load (50 cubic feet)

(c) Super Foot true volume (1/12 of cu. ft.)

(d) Super foot Hoppus (1/12 of cu. ft. x 1/.7854)

Since the foot is the standard length measurement in the foot.pound.second system and since we use tapes graduated in feet and inches, it seems most logical and most economical of time to compute volumes in cubic feet. The cubic foot is therefore the standard unit for research work where the f.p.s. system is used. In conformity with recommendations of recent conferences, the West Australian Forests Department now uses the cubic foot unit in all publications.

The term "load" (50 cubic feet) is still in use by the sawmilling industry however and royalty is still expressed in this term. It is a term that should be dropped because, with the passing of horse-drawn wagons, it no longer has any

literal significance. For road transport, the fundamental requirement is tons weight and for sea freight it is cubic feet.

Because it is by its name a measure of surface area the term "super foot" has no literal significance when applied to the measurement of logs, although originally, it was probably a sound and useful unit. In more primitive times in England when timber was pit sawn and supplied to the job undressed and in a variety of widths, the amount of timber required to floor and sheet and line a job was the superficial area of the surfaces plus a fitting allowance. As the usual thickness of boards was one inch the volume of a superficial foot was 1/12 of a cubic foot and the superfoot thus became a unit of volume which could also be applied to large planks and beams. Today "super" has lost all its literal significance; witness the ungainly antics of some merchants advising the public in their price lists that so many lineal feet of flooring or weather-boards are equivalent to so many feet "superface". What is really meant is that so many lineal feet will cover so many square feet and it would be much more intelligible if they simply said so.

Because the term Super Foot has been used in so many ways for so many different things and because it is so often used thoughtlessly without qualification, it has become a source of confusion even to Australians reading Australian reports and it probably makes it impossible for many overseas readers to get accurate quantitative data from our literature for comparison with their own. We are similarly handicapped in the interpretation of American data.

Taking into account all the previously listed needs in a log measuring system it must be agreed that the only unit that can hope to meet all requirements is the cubic foot and it is therefore suggested that this Conference should pass resolutions urging its adoption.

It is further suggested that there is no real point in keeping the term "Super Foot" in the language at all. Moulded and asymmetrically sawn items are much better listed and priced by lineal feet but can be converted to cubic feet for statistical purposes if necessary, while rectangularly sawn items can be listed and priced by cubic feet just as readily as by the 100 sup. ft. It may well be that the buying public would think that 20/- per cu. ft. looked less expensive than 166/8 per 100 sup. ft.

LOG MEASURING TECHNIQUES

I have so far avoided any mention of the practical details and problems encountered in log measuring.

I think it will be agreed that, when the matter is viewed in the light of all the reasons listed for measuring logs, the displacement volume is the best statement of the volume of a log, but since it is impracticable to measure logs this way, the chosen method should be a relatively simple one that gives a close approximation to true displacement. Practicability forces us to use either the girth at the middle or the diameter (or girth) at both ends. Both methods are correct if the log is paraboloidal and this is the case with logs from the middle portion of a tree length, both hardwood and conifer. Logs from tops and butts are less full than this and for them the mid-girth method is more accurate. It is therefore the more desirable one for general adoption, but if, in some cases, there are practical advantages in measuring both ends the resulting loss of accuracy will be quite small.

Now let us metaphorically pull out the plugs that we previously put in the holes in the logs and see what complications result.

GROSS v. NETT VOLUME

Because a large proportion of logs from virgin but overmature native forests is faulty, the practice has arisen in some States of deducting a defect allowance from individual logs based on a visual assessment of each log. This deduction is usually in the form of a square or circle covering the pipe and rot at the end and carried the full length of the log, but occasionally it is in the form of a length deduction.

If accounts are settled on the basis of net volume the felling contractors and the hauling contractors, who will have done practically the same amount of work as they would on perfect logs (sometimes they will have done more), will be paid less than is ethically due to them; while a sawmiller receiving poor quality logs may well find that he is showing a high recovery. Of course, he knows very well that when he has to handle a large volume of waste he is incurring higher costs per saleable unit which no juggling with recovery figures can alter.

From the point of view of customs and tariff matters outputs related to net log intakes show the industry as working with better raw material than is really the case, allowing importers to claim that its costs could be lowered and that it therefore does not deserve the protection it gets.

In statistical research work in silviculture, forest management, national inventory and economics studies it is unsatisfactory to start from figures that have been arbitrarily reduced from full volume because it disguises the basic productivity of species and forests, possibly leading to false conclusions regarding yields that will be attained under more intensive management in the future, and certainly confusing interstate and overseas workers.

The alternative to settling accounts on net volume is to use gross volume and an appropriately lower rate per unit. Over a period the cost of logs to the miller would be the same but the cost of keeping the log records would be appreciably less to all parties concerned.

CONCLUSION

That, Gentlemen, concludes a brief statement of the case for the adoption of the cubic foot gross volume as the unit for the measurement of logs for all purposes in Australia and it is suggested that Conference should debate the following resolutions:-

1. Conference urges all Commonwealth and State Authorities and all Organisations connected with the production, handling, sale, conversion and recording of timber in the form of logs to adopt the cubic foot gross displacement volume as the unit of measurement to be used in all transactions, periodic reports, statistical statements and research reports.

2. Conference urges all Commonwealth and State Forest Authorities and all Sawmilling Organisations to state percentage recovery figures on the basis of gross displacement volume.

3. Conference urges all Government and Private Organisations concerned with the selling of logs to state their royalties or stumpages at so much per 100 cubic feet of gross displacement volume.

4. Conference urges all Commonwealth and State Authorities and all Organisations, Firms and Individuals connected with the production, handling, sale, use and recording of sawn and/or moulded timber to adopt the cubic foot and the lineal foot as their units of measurement, whichever is more appropriate to the particular items concerned. Where moulded sections have to be added to rectangulr sections for statistical summaries they should be cubed on the basis of their rough-sawn rectangular dimensions.

5. Conference resolves that the Division of Forest Products of C.S.I.R.O. be asked to compute a table of log volumes in cubic feet and that Council be instructed to make whatever arrangements it finds most appropriate for the publication and sale or distribution of this table.