Research and Experimental Work for the Rationalisation of Logging Operations

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Finland's forest industry has engaged in continuous, successful rationalisation work at its industrial plants without which it would have been impossible to maintain competitive ability in the ever-tightening world market. A purposeful endeavour has also been made to develop the methods and equipment used to acquire raw timber although the solemn-sounding name rationalisation has not been applied to this aspect until the last few years. In the following the progress of this work from the initial phases to the present level are recalled as a background for the outlines of future work.

The pioneering scientific work which constitutes the basis of the rationalisation of forest operations was done in Finland at the beginning of the 1930s by certain private workers, two of whom were the late professors *Ilmo Lassila* and *Ilmari Vuoristo*. The former, the first occupant of the chair of Forest Technology at the University of Helsinki, was concerned primarily with the theoretical prerequisites of forest work research and took his inspiration from the American pioneer of work study, F. W. Taylor. Vuoristo, who was later the first professor in Forest Technology at the Forest Research Institute in Finland, on the other hand, applied work study methods in practical forest operations. In so doing he assembled extensive time study materials and experimented with new haulage methods. He also conducted work studies at sawmills and in floating work. It may be said that the methods of collecting and handling material used in Finland's forest work studies until now have followed in many respects the forms worked out under the guidance of Professor Vuoristo.

It was not until after World War II that a new phase began in forest work research in Finland. The necessity of such studies first became obvious in our country because of the war-time scarcity of forest labour. The committee set up to deliberate on common wage bases for forest work came to learn in the course of its work that approximative makeshift data were not enough to provide just wage rates for different felling, preparing and hauling jobs. Sufficiently extensive forest work studies were necessary to provide generally applicable data on the effect of different factors on work achievements.

It was principally for these wage rate studies that *Metsäteho, the Forest Work Study Section of the Central Association of Finnish Woodworking Industries* was founded in the spring of 1945. A special council, the Metsäteho Committee, was established. Its membership consisted of the chief foresters of the major forest industries in the country, representatives of employer and employee organisations, and representatives of VAPO, the State Railway Fuel Bureau. It was considered necessary that practical forestry should take the lead in this research and that it should concentrate on questions of specific interest at a given moment. As far as possible, the research work was done from the very outset in really practical conditions at the working sites of the member companies. This rule has in fact been followed in both wage rate studies, and method and equipment experiments.

Although establishing just wage rates for the different forest operations was the most urgent task, it was held from the start that the rationalisation of logging operations was to be the research target proper. Indeed the rules drafted for Metsäteho state the aim of the establishment to be »to plan and carry out research towards the following ends in practice: improving the effectiveness of forest work and timber transport, determination of fair standards for forest work wage comparisons, creation of a basis for measures, to improve the social standing of forest workers, rationalisation of the general administration of forestry». Further, the results of the work must be made rapidly available to those concerned.

Performance of work studies for the determination of wage standards also furnishes material necessary and serviceable for rationalisation. It is clear that only when achievements of the traditional felling, preparation and hauling methods and how they are affected by different factors are known, can the profitableness and other pros and cons of the new methods be assessed. On the other hand, even forest work earnings guaranteed by uniform wage standards and unaffected by the kind of timber to be prepared and the quality of the forest are points which in themselves mean rationalisation that is comparable with standardisation judged from the standpoint of both the employers and workers.

Immediately after its inception Metsäteho tackled the urgent tasks assigned to it by the wage standard committee. The first jobs investigated were felling veneer birches in summer and barking cordwood in storage areas. The next items on the programme were the collection of fairly extensive materials on the preparation and horse haulage of logs and cordwood of different types. As the average work performances of a few dozen workers in all subjected to time study could not be regarded as representing the average work performances of the country's total forest labour force — hundreds of thousands of men — statistical data were collected for several years on the number and length of loggers' and hauliers' working days and work performances in the preparation and

One of the major problems in Finnish logging is to get the motorised transport closer to the stump. Since the plowing of the deep snow has proved too difficult, various other methods have been tried, e.g. packing the snow with heavy rollers or vibrating plates as in the top photo. The second photo shows an ordinary agricultural tractor converted with semitracks and a boom winch for logging purposes. Truck transport of timber has increased considerably during recent years. Logs are loaded generally with boom winches as in the bottom photo

haulage of different types of timber. The effect of the post-war shortage of equipment on the availability of forest labour, on the condition of the workers and on the work performances was still a topical question at that time and an orientating statistical study was consequently made of the then living costs of forest workers.

As soon as the most urgent field work of the wage standard studies had been performed, experiments and investigations concerned purely with rationalisation were started in close co-operation with the member companies. First among them were various experiments comprising hauling resistance measurements aiming at the development of road maintenance equipment.

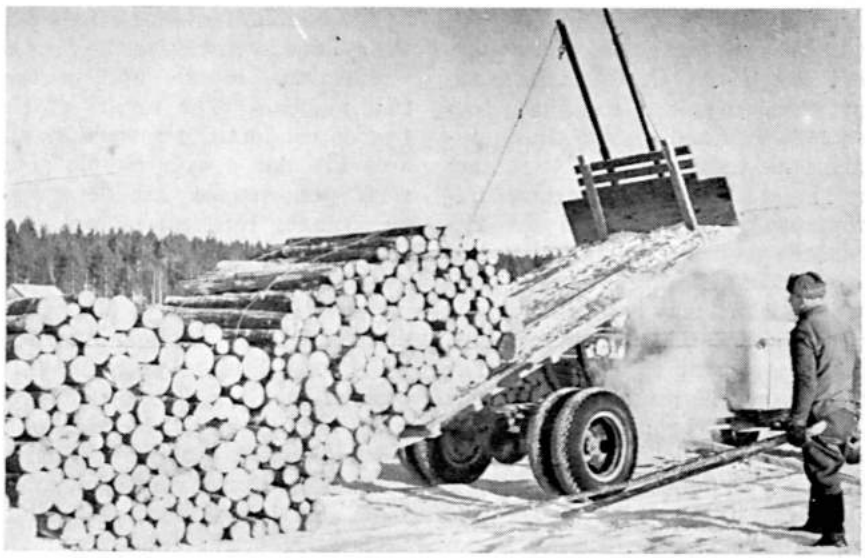
Some 2—3 years after its establishment Metsäteho began to collect yearly and systematically suggestions for inclusion in its research programme. Numerous proposals have been made in the course of the years, sometimes too many and some projects have had to be postponed of necessity. It is worth noting that the interests of the member companies vary from one year to another, issues considered important today are sometimes shelved and reopened in a couple of years.

The wage standard studies on traditional manual felling operations and horse haulage were completed some years ago. But progress has introduced new problems such as the preparation of new types of timber, and the changes in work performances due to the new methods. The principle applied in investigating a job done primarily by hand has been to link the preparation of new types of timber and new dimensions with the preparation of old, familiar types so that the fairness of the wage standards can be maintained, especially as seen by the workers themselves. The nature of the newest forms of work, especially jobs in which machines are used, and the factors affecting the work performances differ from the traditional to such an extent that the tie between the two is not immediately apparent, nor need it be made so.

In these circumstances it is possible to make do with more rapid work study methods than before, especially as Metsäteho's earlier, extensive basic studies have evolved the general laws governing the work of handling timber, the dispersion

of the time study materials, and the effect of factors such as the size of trees and logs, the kind of timber, barking degree, distances, air temperature etc. on the expenditure of working time. The greater the contribution of machines to the preparation, handling and haulage of timber the greater is the extent to which machines determine the speed of work and the more considerable is organisation as a factor in operations. Work study methods must, then, be better applicable than before to different team work studies. Metsäteho has developed such methods and applied them. The development of new methods of investigation is a constant interest and the subject of experiment especially for jobs that are becoming mechanised.

Investigations of both wage standards and work methods have been extended in the course of the years to cover practically every aspect of felling and preparing timber, skidding, short-distance and long-distance transport, floating and storage, marking, measuring and protection. Progress in these fields has been very rapid in Finland, especially in the 1950s. In haulage work, trucks with mechanised loading equipment and bundling performed on the truck platform or in connection with loading, and agricultural tractors have assumed prominence. New forms of work introduced in the last few years are preparation of timber alongside the strip road and haulage from alongside the strip road, and the increasingly generalised storage of timber on ice. The growth of bundle transport is a notable change in floatway transportation, brought by rationalisation and the improvement of waterways. In recent times, power saws and mobile barking machines have produced revolutionary changes even in the logger's work. All these new methods and equipment have led to lively experimental work and the research associated with it. For although new, mechanised methods may have been established technically, only accurate, comparative work studies and analysed cost calculations can show when and on what scale they are profitable in different conditions. Moreover, there are the factors of equipment maintenance, the training of workers and the weighing of investment targets which must all be taken into consideration in a comparison of the different methods. A



A well-organised job. The barking machine attached to the tractor can easily be moved to scattered intermediary storages. With the aid of conveyors a few men can handle the operation. The second photo shows pulpwood bundles being dropped from a truck platform onto the ice which serves as storage until the spring floating. Bundle floating offers many advantages compared with floating of loose timber. In the bottom photo log bundles are conveyed in railway waggons from one lake over a neck of land to another. The waggons roll right into the water until the bundles are afloat

valid general observation is that bringing machines into the forest to do the work phases previously managed by hand or horse is often not profitable as such, for instance because of the small size of the working sites and many other considerations. In the application of machines in forest operations attention must also be paid to the logging process as a whole and an endeavour must be made to re-organise these jobs for the requirements of mechanised equipment and at the same time to exploit the advantages of machinery without imitating slavishly the old working methods and organisation. The use of mechanised equipment and motor vehicles often makes it possible to eliminate unnecessary work phases and results thus in a saving in the logging process as a whole. On the other hand, in calculating the results factors such as the fixed costs of the equipment and the cost of moving it must not be overlooked. Other considerations to be remembered are the questions of the deterioration and quality of timber and other such factors which may produce surprises in the application of new methods. It is important to remember that the favourable results of some new methods can be achieved only in certain conditions and are not generally applicable. The same naturally applies also to negative experiences.

In purchasing or themselves constructing new equipment and machinery Metsäteho's member companies need reliable data and reports on existing or planned models. Metsäteho has long deliberated the establishment of a special experimental station such as Finland's neighbouring countries have in connection with their research institutes. So far however, for cost reasons, Metsäteho has only studied the use of new equipment and machines at the working sites of such of its member companies as have acquired them and has collected data on the experience gained with them. This activity will be intensified further and new, more effective forms than before will be worked out. Here too it is necessary to remember what was mentioned above concerning the organisation of experiments with machines and equipment — the overall organisation must be taken into consideration. It must be kept in mind that criticisms are tenable and reliable only if it has been possible to experiment with the equipment in practical work and preferably compared with other equipment of corresponding kind. It is not always easy to arrange such experiments, nor are the results often conclusive. The routine testing of machines, on the other hand, is a consideration in itself and requires special establishments. The results obtained in these are not adequate to permit conclusions as to the suitability of the equipment for practical conditions.

The communication of the research and experiment results obtained by Metsäteho to interested parties is done in writing in the form of publications, reports and instruction manuals. The results of the studies conducted for wage standards are not always simple since work performances are dependent on so many different factors. For the same reason the results obtained at the so-called experimental working sites cannot always be written up merely as concise final inferences which may lead to over-simplified conclusions. It must be remembered that the problems Metsäteho is commissioned to solve are often of such a kind that it is difficult to set them out in the form of results with little work. The results of more extensive investigations generally appear in a series called »Metsäteho Publications»; 38 of these have appeared in the period 1945—57. However, the number of publications is greater in the »Metsäteho Reports» series; they are concise, either duplicated or offprints from periodicals in the field. 140 of them have been published in the same period. In addition, some instruction manuals have also been published on subjects such as the building and maintenance of horse haulage and motor roads for timber, and the use of explosives in forestry. The most recent instruction manual reports on timber transport by wheeled tractor. Both the »Publications» and the »Reports» have English summaries.

Metsäteho has had to an increasing extent to furnish information to its members also directly, by letter and orally, on the results of the investigations made and on various machines and equipment and their suitability in certain conditions. Films (16 mm.) made by the Institute's own staff have proved a perspicuous and popular means of introducing new methods. These films are lent to members and others and have been much sought after. Among other means of disseminating information may be mentioned courses in forestry machinery, lectures and conferences, and excursions. The large numbers of participants in all these are proof of their necessity.

Metsäteho's staff, apart from the chief, includes four permanent research foresters, one forester-engineer and a special information forester. Many of them have taken scientific degrees at the university in addition to their degree in forestry. Besides the permanent staff, there have been 2—3 foresters engaged on a temporary basis for special investigations. Forestry trainees are usually employed to collect research materials in the field. The total staff has varied from 20 to 30, depending on the number of temporary staff.

According to its rules, Metsäteho's tasks include also »following progress in the branch, both in science and in practice, and both at home and abroad». This takes place through keeping up with the literature and by travelling. Metsäteho's staff read regularly both domestic and foreign periodicals and enter up in the card index reference to articles of specific interest. With the corresponding foreign establishments there is a mutual exchange of publications and trips are made both within Scandinavia and also to other countries to study the research and experimental work done there. Visiting experts are often seen at Metsäteho's premises and on such occasions ideas and experience may be exchanged. In present times, research, especially that directly serving practical ends, has become collective to a large extent. The private investigator of yesteryear has been replaced by research institutes, and international co-operation has become livelier. This applies equally to forest work studies and rationalisation.

Helsinki 1958, Frenckellin Kirjapaino Osakeyhtiö.