

DAVID HENRY SCHOLARSHIP REPORT
STUDY TOUR TO SCANDANAVIA
AND BRITAIN

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N.Z. Logging Industry Research Assoc. Inc.

Project Report No. 18
1982

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AND BRITAIN

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I wish to express my thanks and gratitude to the Trustees of the David Henry Scholarship and N.Z. Forest Products Limited for awarding me a 1982 scholarship which financed most of the expenses incurred in this tour.

I would also like to thank LIRA's Board and Director for their support and assistance.

The study tour was not only of great benefit personally, but will have considerable benefit to LIRA in enabling the transfer of research and development work to practical field use to be most effectively carried out.

OBJECTIVES OF TOUR

To gain better knowledge and understanding of the methods of implementing the results of research and development. In particular, the progression from R&D through the various methods of extension, demonstration and training to implementation of new technology in the field was to be examined.

The tour concentrated on the extension and training activities of Scandinavian and British research organisations, training schools, and machinery manufacturers.

INTRODUCTION

As the result of being awarded a 1981 David Henry Scholarship, a three month long study tour was undertaken in Scandinavia and Britain.

The first country visited was Sweden where six weeks was spent visiting and studying in operation research and development organisations, various forest worker schools, and machine manufacturers' extension activities. A further week was spent in Finland, the time being evenly distributed between a forest machine operator school and the Finnish research organisation, Metsäteho. A week was also spent in Norway, with the itinerary being organised by the Norwegian Extension Institute. The tour concluded in Britain, where two weeks was spent with the education and training branch and the Norman Work Study Unit of the British Forestry Commission.

Following the study tour the ECE/FAO/ILO seminar on 'The Management of Forest Working Training' at Dumfries in Scotland was attended on behalf of LIRA.

This report is presented to the Trustees of the David Henry Scholarship to fulfil the acceptance requirements of scholarship participants.

The report is presented in two parts:

Part 1 - Extension activities and lessons learnt.

Part 2 - Training approaches and facilities offered by the countries visited.

Further details on any matters arising from the report are available from the author at LIRA.

S U M M A R Y

The opportunity to view extension and training techniques as practised in other countries, has given a new perspective to the importance of these areas to a research organisation such as LIRA. Many lessons have been learnt and are reported on fully in this report.

The key lessons on extension are :-

1. The need for research organisations to not only disseminate research quickly, but to do so fully and to ensure that this is available to the people who can best benefit by the research findings, i.e. at the level of operational control.
2. To ensure that the research is disseminated in as professional a manner as possible by using outside expertise where gaps exist in own knowledge, and, to use professionals for such things as drawings, films, and slide/tape presentations.
3. The importance of the research organisation to the training organisation in ensuring that training is kept informed of new techniques and their correct application.

Training, as practised by the countries visited, was on a far higher standard than that so far attempted in New Zealand. In many of the countries visited, the logging industry was actually significantly smaller than New Zealand's. They still deem it necessary to run courses of up to four weeks for operators. The level of monetary input to training was impressively high as was the level of skill and motivation of those employed as instructors.

The commitment of all in the industry to training, from research organisations, training bodies, machine manufacturers, to the bushman himself, has allowed development and introduction of highly specialised machinery. More importantly, in Britain, it has enabled an extremely high standard of felling presentation to be practised thus ensuring the first and most important stage of a harvesting operation is done well, i.e. each phase of the operation is seen as being only a part of the whole system.

Finally, it must be clearly understood that a research organisation can only be as good as its disseminating practices allow it to be. Without the level of training, which is carried out in these countries, much of the research would not be used. Similarly, the training organisations can only be as good as the support and the passing on of research they get from the research organisations. Thus, it would be fair to say that one can't work without the other and vice versa.

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PART I

EXTENSION

INTRODUCTION

There is often a gap between known technology (the results of research and development work), and applied technology. It is common knowledge also that faster application of known technology would result in increased effectiveness, safety and profitability in forestry. The reason for this gap between known and applied technology is often a lack of communication between researchers and those who use research results.

Research bodies should attach great importance to disseminating the results of their research so that they can find practical applications. Not only for their own benefit in justifying their existence in the eyes of those providing finance, but it also serves as enhancing the motivation of individual researchers if they can see their work being used in the field. Not all the work of disseminating the results should be carried out by the research organisations. It is vital that all conceivable resources and channels are used. Not only does this save the researchers time, but also involves others which may be better placed to carry out this work. However, the primary responsibility must rest squarely with the research organisation.

It is worth, at this stage, looking at a graph drawn by Nordjanjo, Skogsarbeten's head extension officer, on the effects of disseminating results.

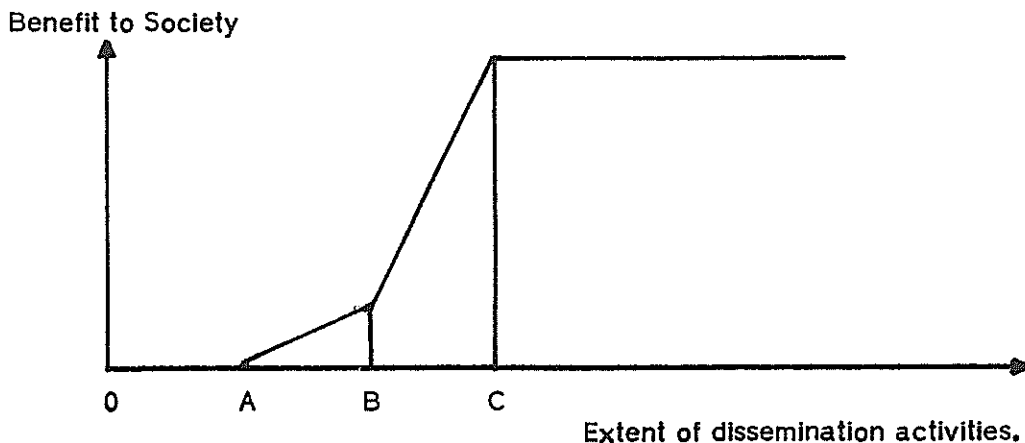


Fig. 1. The relationship between the extent of dissemination activities and the benefit to society arising from these results.

This graph shows the theoretical relationship between the effort made to disseminate research and the benefit to the field or branch the research is aimed at. The progression may vary but the shape should remain fairly constant. The points between 0 and A show limited effort being made, consequently the results remain unknown. A-B results are beginning to be noticed but this is still a long way from the optimum. Research organisations, or, for that matter, manufacturers or importers of machines, should always be aiming somewhere towards C. Between B and C the cost of disseminating is less than the benefits obtained from the knowledge being disseminated.

TARGET GROUPS

Before extension efforts are started it is essential to decide who the extension should be aimed at, thus target groups should be established early on in a research projects effort. Firstly let us look at the main target groups in New Zealand.

1. Forest Managers
2. Middle Management
3. Supervisors and contractors
4. Forest workers.

The first group would consist of the managers of forests. These people have many duties, so often don't have a lot of time to devote to reading of reports or attending demonstrations. Nevertheless, they are the first people, and often the ones making the ultimate decisions which will affect whether or not the results of research will be used in their forest. It is, therefore, important that they are informed.

The second group is the Logging Manager, the planner, the smaller forest owner and other researchers. These people are more involved in day to day decisions and are likely to have more time to read publications fully and attend field days, demonstrations, and seminars.

The third group of supervisors is less likely to read project reports or highly technical reports not specific to their sphere of influence. They are, however, often the key to progress, the people which can best assist in encouraging forest workers, contractors, to try a system and to monitor that system for the researcher.

The last group, that of forest workers, or small contractors, are the least likely to read a publication. They are, however, the people most likely to benefit from a field demonstration, if the system demonstrated, or the machine demonstrated, can be shown to be better than their current one. It is, therefore, important that they are invited to demonstrations.

With most research results, all groups should be exposed to the findings. It is not enough that the first two groups are informed on the assumption that they will inform those beneath them. Often this doesn't happen, or part of the message is lost in the telling. Therefore, research results should be presented in a form suitable for the respective target groups, even if this means repetition.

EXTENSION TECHNIQUES

The effectiveness of extension is closely allied to the technique used to disseminate the knowledge. The diagram below indicates the effectiveness of various avenues of extension. Each avenue of extension viewed on this study tour will be studied in some detail and the effectiveness of each commented on.

WHO IT REACHES	AVENUE	COMMENTS
Reaches everyone	Radio/Paper/TV	A lot of people hear of or see it but little or no detail is available
Reaches a more specific group	Reports/Newsletters	Increases detail but there is little feed back
Reaches a smaller group of people (100-150) specifically interested	Seminars/Field days	Good avenue, good feed back. Requires strict control
Smaller group of up to 30 people	Courses/Group training	Specific information being given can give good feed back
One person	One to one instruction	One to one instruction - best method but most expensive and time consuming

The tip of the triangle, where a one-to-one situation is reached, is obviously the ideal. However, as mentioned, it is expensive. The other areas, however, shouldn't be forgotten as these are also avenues for stimulating interest.

PUBLICATIONS

This is the most common-used method of extension and takes several forms, each catering to a different level.

Project Reports

These are normally large, more than 6-8 pages, which report on the entire project. This type of report is aimed at the specialist and contains all relevant detail of the project. Due to the size of these they are often not fully read, and people will tend to read only summaries and conclusions. It is essential that good summaries are written which will entice the reader to more fully read the report. Ideally, graphs, charts, diagrams and photographs should be included wherever possible to increase the clarity and interest of these reports.

Brief Publications

Normally no more than four pages, and can be in many forms, i.e. machinery evaluations, technical releases, newsletters, etc. The brief publication, because of its size, is more widely read and should therefore be kept as simple as possible. A much smaller range of information should be included in these than a project report, as you are normally trying to get a specific point across to the reader.

Information

Information publications should be very general and easily followed. These are often read by people with no understanding of the industry they relate to. An excellent example of this type of publication is that given out by a company such as Kockums of Sweden (machinery manufacturers). The type of material they hand out to visitors includes :

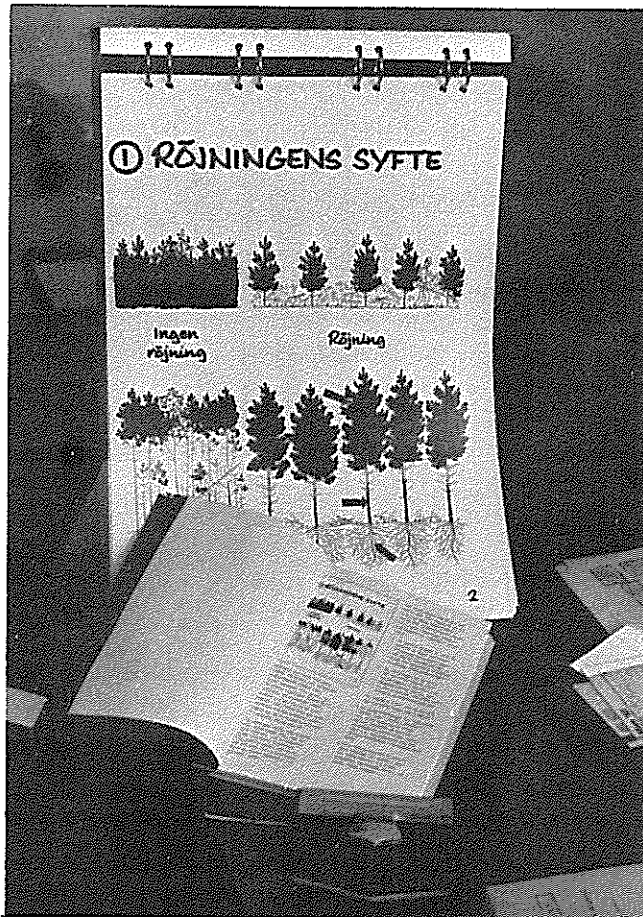
- general introduction to Kockums Industries,
- machine specifications,
- Skogsarbeten report on logging with harvesters,
- Skogsarbeten report on logging in Sweden.

This range of publications covers in general terms all anyone would want to know about their machines, plus the inclusion of the two Skogsarbeten ones gives some good background information on the Swedish logging industry, and on trials conducted using the types of machines that they are selling.

Handbooks

Handbooks or manuals are normally aimed at the levels of forest supervisor, forest owner (smaller), and forest workers. In all countries visited they are also widely used in schools or training branches. They can be used to cover a wide range of topics,

from planting, cutting to length, to basic first aid. They need not be left until the project is finished before being produced but may well commence publishing as soon as enough material is available. One point observed in Sweden which is worth mentioning, is the use of a manual at a course before it has even been published. The manual on volume/value crosscutting was being tried out prior to final publication.



Manual and flip chart combination on release cutting, developed by Skogsarbeten.

An example of how one manual was introduced is the one on release cutting done by Skogsarbeten. This handbook was taken round the country and six one-day courses were run on the book, discussing what's in it. A professional demonstrator from Husquarna was used to do field demonstrations. This particular manual was accompanied by flip-chart presentation which could be used in the field. These flip-charts are a series of instructional drawings with limited text, which follows the manuals. They are large enough that they can be used in a group of 20 people. They are waterproofed and have extra

pages for the instructor to draw on. There is a part of the manual set aside to assist the instructor in using the flip-charts. These are very popular now in Sweden and appear very effective. It is essential that all drawings done in these are of a professional standard.

The instructors manual includes a section on how to control the discussion.

"The best way to stimulate and direct discussion is questions. You can use questions to open a discussion, to keep those who talk too much quiet, and to steer the discussion back to the subject."

"Questions should be stimulating. They should make participants think and work to become involved, e.g. is there someone with more knowledge of this particular detail. Can you give us an example which explains what you mean, etc, etc."

This type of material (handbooks or manuals) is only of any use when it is used, so it is vital the people are made aware of its content and how to use it as quickly as possible. This is generally well practised in Sweden, to the extent that companies will contract Skogsarbeten to develop a specific course, plus manual and flip-chart for their particular requirements. Once this has been done a Skogsarbeten person is then used to teach their instructors how to use the package.

The next form of extension dealt with is that of a group or meeting extension. There are three main forms of this : Seminars, courses, and demonstration field days. Courses have already been dealt with to some extent in the section on handbooks/manuals, however, it is worth singling out and dealing with it in some detail.

SEMINARS

Seminars take many forms but are normally an opportunity to gather together larger numbers of people to inform them of a particular topic, and involve them in discussion as to which directions further research should take. Seminars also provide an opportunity for people from different companies to meet with one another and discuss informally problem areas, or areas where they have had some success in which they can assist each other. This is very important as often there is little communication between different companies which means they may well be solving similar problems someone else has already solved.

An example of a small seminar is the one attended, run by Skogsarbeten, where they were discussing the application of worker participation in planning decisions. It is important for this type of seminar that the right people are involved. This is guaranteed by deciding who is required by the people running the seminar and making their approach to these people. In this case there were representatives from forest workers, supervisors, forest managers and district or area managers. There was a total of 28 participants, arranged into five groups. Early in the seminar they split into their respective groups to tackle some problem. This gives the groups an opportunity to get to know each other, and also ensures the involvement of even the most shy persons.

This seminar was a working one so it was essential that adequate space be given for the delegates to spread themselves out. Each group was seated at a cluster of tables. At the beginning they were given out seminar notes and paper to make notes on themselves. Also, when each group reported back they had to do so using one of the aids provided, i.e. overhead projector foils, blackboard, flip-charts, etc. This whole seminar was quite informal. The objective was to involve ad lib discussion rather than sit through a series of addresses.

The seminar attended on the Management of Forest Worker Training is the other end of the scale. This involved delegates from some 18 countries, interpreter facilities, formal paper presentation, etc. At this seminar papers were delivered which discussed various countries techniques of training. The seminar also included two field days.

While these two seminars were widely differing in size and content, they were both attempting the same result in the exchange of information. They both required the same high degree of organisation to ensure that delegates got the most possible from each seminar and that each seminar ran as smooth as possible.

COURSES

The difference between a course and a seminar is minor, to say the least, and often they overlap. The same type of audience involvement is required. However, the course is often more structured and covers a much narrower field, i.e. the course run on cutting to length for optimum value/volume recovery was attempting to teach people in management (supervisors) how best they can do this. A course normally requires a manual, or set of instructions, which can be followed. It is essential that



Flip chart being used at course on volume/value crosscutting.

for courses, participants can actually go to the field and practice what is being preached. Once again, it is essential that the correct people attend a course. It is no use involving the forest manager in the above course as he only has to return to his station and further teach supervisors who in turn take it to the cutters, thus they lengthen the chain of communication. Therefore, courses should always try and attract those that are closest to the carrying out of the subject to be discussed.

The other type of courses seen on this study tour, which are not normally catered for in New Zealand, were those aimed at teaching the basics in forestry to those involved indirectly in the industry. Examples of these are courses run by Domonverket for their

clerical staff and a course run in conjunction with a forest school at Ljusdal for Kockums sales people and office staff. These courses give people who are constantly dealing with the logging or forest industry people, an opportunity to understand better jargon used by the forest industry. The course length is normally only one week and content is on a basic level. An example of content of the Kockums course is outlined below.

There would be short lectures given on each of these subjects and others:

- forest law
- forest production
- machine operation
- planting and silvicultural operations
- machinery availability, how to control and follow up
- logging planning, etc.

Apart from the value of giving sales people notes they can refer to, it also gives them a much better understanding of how the machines they sell affect the overall forest scene.

Basics for Good Seminar and Courses

The following list is some of the aspects which need to be kept in mind when organising and running a seminar or course :

1. Are the right people attending. If someone is missing contact and outline the advantages for them to attend.
2. Use outside expertise to cover gaps in own knowledge.
3. Keep sessions short. Aim for a maximum of 30 minutes for one speaker.
4. Don't have the same speaker speak consecutively without a break.
5. Ensure a break for leg stretch, smoke, comfort stop, every hour.
6. Good ventilation is essential, especially straight after lunch.
7. Publicise the event in trade journals and try and involve the local press.

It is a good idea for a well run course seminar to have a checklist made up of things to do and the time before the seminar to do this, i.e.

- three months prior to the seminar book conference facilities or room,
- 2½ months prior have speakers return main headings of papers, thus enabling a check to be made that they will talk about what you want them to
- 2 months prior send out registrations, seminar programme
- one week prior, check everyone knows what their responsibility is and notify local paper, etc.

This type of checklist ensures that there are no last minute panics that something hasn't been done. A similar technique could be used for field trips for demonstrations.

FIELD DEMONSTRATIONS

For this report I will use as an example as to how field demonstrations should be run, the one organised by the Education and Training branch of the British Forestry Commission for the FAO-ECE-ILO seminar on "The Management of Forest Worker Training" at Dumfries in Scotland. The field day was used to show how the Commission went about training and to give people a chance to view training facilities at the Ae machine operator training school and the Ae management training centre.

The party was split into two groups, and viewed different things, meeting again for lunch and to go back to hotels. The field day involved some nine stops. At each location a member of the Education and Training Branch gave a run-down on what was to be seen, the demonstration or tour was then conducted, then a summary was given. There was a period allowed for questions. At no time during the day did the two groups cross, other than at lunch. Each area was well defined with red tape marking off points past which spectators were not to go. Notes had been previously prepared to be handed out, further describing the various stops. At one stop, where it was important for the amount of slope to be shown, a bubble scale had been mounted on the front and side of the machine to highlight this. The confidence of the people talking to the group could never be questioned. This is an essential requirement if any credibility is to be established. The whole day was kept rigidly to schedule by each group having two people in it responsible for chasing up people which started lagging behind.

The two key points about this field demonstration, which made it stand out, are, the organisation which resulted in such smooth flow and the fact that it was able to tie together the previous days papers, thus making them more meaningful to participants.



Machine demonstration using gauges to illustrate slope.



Demonstration using prepared stump and log to illustrate felling and delimbing techniques.

Essentials when Setting up Demonstrations

1. Organisation must be well controlled. One person must be responsible and adequately brief anyone else involved in the exercise.
2. The circuit, or site, must be checked for timing of arrival, departure, access, parking, etc.
3. There should be nothing to distract their attention from what is being shown, i.e. no logging crews working 150 metres away where noise will interfere.
4. Any aids, such as charts or photographs, must be weatherproof, clearly visible to the furthest people in the group, and relatively self explanatory. These should possibly be raised up for better visibility.
5. Those people speaking to a demonstration must know backwards what they are talking about, as half the audience will be trying to catch them out. Also, if the machine is being operated, the operator should be the best one available, even if he has to be brought from somewhere else.
6. Set the demonstration up so that it will work. Nothing stays in peoples memories more than a machine that broke down, rolled over, or got stuck or a chainsaw operator whose chainsaw won't start or who gets a hang-up on his first tree felled.
7. Have areas for people to stand in well defined and don't allow people to cross these.

8. Keep people to schedule. Don't allow to go over time by any margin.
9. Where groups of more than 20 are being spoken to, use a loud-speaker, don't attempt to speak over the noise of the machine. It is better to shut the machine off or move away from it.
10. Ensure that the demonstration or field day has been adequately advertised, and once again, the right people are coming.

SLIDE TAPE/MOVIE PRESENTATIONS

These two are excellent mediums when trying to reach the forest worker, supervisor or general public. Obviously, the requirements for the forest people will be different to that for general public.

There are four key points before starting this type of presentation :

1. Who is it aimed at, and what should they know
2. What is in it, brief description
3. The presentation length
4. How long will it take to make, thus, how much will it cost.

Movie film should only be used where movement is important, otherwise slide tape is better as it is cheaper, easier and quicker to do. An example of this could be to use a slide tape to illustrate a subject such as cutting to length where movement is not essential. Where felling and delimbing techniques are concerned, it would be better done using a movie.

The production of a film/slide tape may take the following type of approach as practised by Skogsarbeten.

- (a) A discussion between extension and research as to how best to present their results. They decide to use an instructional film, subject, "the brush cutter". This is to include a film, a manual and a flip-chart.
- (b) They then decide what the film is going to show, suggest areas in which to do the filming, and write a rough outline of what needs to be said. Also, at this stage, a decision needs to be made on the length of the film. A decision is also required at this stage as to what drawings need to be done and preparation to get these done professionally need be made.
- (c) The film is then made by a person who knows what they are doing.
- (d) This is then roughly edited by that person giving about one hour's film.
- (e) This one hour's film is then further edited by the researcher, extension people and filmer, to the required length.
- (f) The final script is now written.

The film is now ready for viewing, accompanied with the manual which the people viewing it can take home with them for further reference, and a flip chart to assist in explaining any details which need further coverage.

Some Basic Points When Doing This Type of Presentation

1. Use 16 mm film. It can then later be copied or put on video.

2. Instructional films should not be longer than 20 minutes.
3. Review, or general films, can be 25-30 minutes.
4. Use professional camera operators.
5. Use very good speakers when doing soundtracks.
6. Use professionals when doing diagrams or drawings.
7. Update as required. Don't use material ten years old.
8. Have attention catching start and finish.
9. If an incorrect technique is used to illustrate a point, it should immediately be followed with the correct technique. Never make a joke of a film.
10. The film/slide tape need not, or should not, stand on its own. It should be accompanied with a manual so it should just cover parts which are easiest to cover by film. The film/slide tape should be done first, then the manual.
11. It is easier to use drawings as they reprint better and offer less distractions.

COMPETITIONS

One aspect which we in New Zealand are beginning to become more involved with is that of competition. Many of the people spoken to on this study tour cited competition work as a good way to give incentive to the learning of new techniques. To this end a set of the rules for the world championship felling and delimbing competition was obtained. This point needs further research in New Zealand, but is a good concept.

TRAINING

The point where extension becomes training and vice versa, is a hazy one to say the least. In the second part of this report training is dealt with more fully. It is fair to say that without good training organisations, a research organisation cannot operate to its fullest efficiency and without research trainers would be teaching one technique. Both these organisations must feed from each other to be fully successful.

CONCLUSIONS

This section of the report has outlined steps required and the types of avenues available to disseminate research. It is important that the group, or groups, the research is aimed at, can be established early in the projects life so that results can be geared to meet particular requirements of that group. It is also important, early in the project, to decide what avenue of extension should be used as some such as film, slide/tape, require long lead-in periods.

While publications are often the easiest and quickest for dissemination which a researcher can use, they are often not as widely read and understood as is desired. It is therefore important to keep them as short as possible and not to load them with too much highly technical information. A good method of introducing a publication is to do so using a seminar or a course. These require a very high quality of organisation and have the additional advantage of gathering together people whom often don't meet and providing them with an opportunity to discuss problems which they may have. When reporting on a piece of machinery this type of publication is often best done at a field demonstration of the machine, where features can be highlighted. Once again, the very highest organisation is required.

The slide/tape movie presentations, accompanied by a manual, is possibly one of the best forms of extension, as these can be widely used by others than the researcher. It is important with these, as with all avenues discussed, that as professional an approach as possible be used to firmly establish the credibility of what is being presented.

All dissemination should be aimed at teaching or telling people of a new or different concept or technique, thus, the most important people to understand the disseminated knowledge are often those directly involved in training.

PART II

TRAINING

INTRODUCTION

The second part of this report deals with the training activities of the countries visited. Each country's approach or technique is dealt with separately, giving a basic background to the size of the industry and the type of training organised within that country. Details of course length and, where possible, course content, is given. Due to the length of time spent in Sweden, a far better insight into their training system was gained. However, the one which is most applicable to what is practised in the way of logging techniques in New Zealand is Britain's.

The British have basically followed the Swedish approach, only have modified it to suit their specific situation. Many lessons can be learnt and applied here in New Zealand. The use made of trainability testing as a means of establishing a persons ability to grasp a new technique, is a particularly good method of ensuring that the correct people are trained initially. Those who have difficulty grasping new techniques should not be forgotten, neither should they be grouped with fast learners, as they will miss much of what is being taught.

The other key area is that of machine operator technique. This is discussed fully as covered in each country, and there are many lessons for us in New Zealand from the various approaches taken.

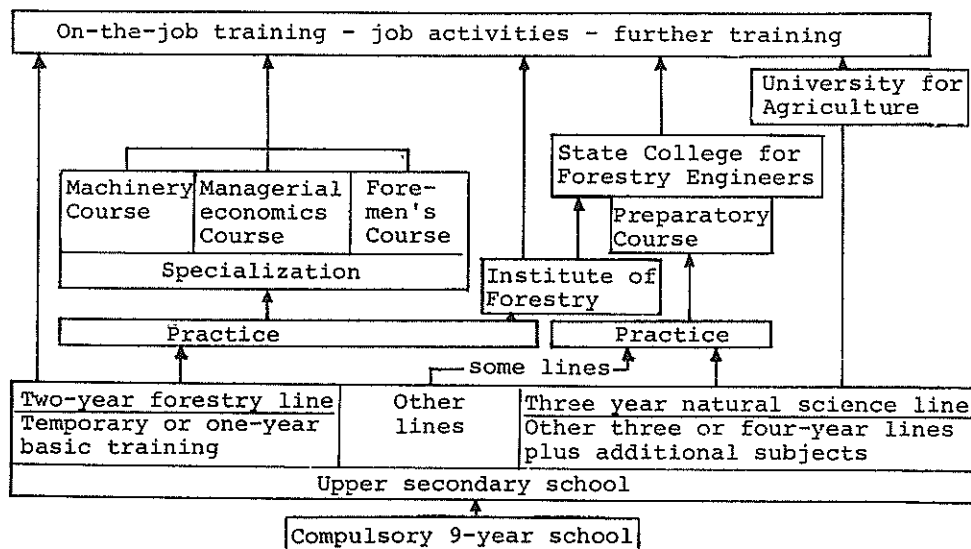
2.1 SWEDEN

Background

The forest area of Sweden is approximately 22,5 million hectares. Exports by value of forest products make up 20% of Sweden's total exports. It has been well recognised by the Swedes that machines, methods and techniques are only as good as the extent to which they are employed. The education of forest workers in Sweden has been designed to allow the development and implementation of highly efficient harvesting machines and systems as well as the simplest manual felling and delimbing. This has been done through a three-tier system.

- (a) Basic forest worker education
- (b) Instruction by forest companies
- (c) Instruction and training by machine manufacturers.

The table below illustrates where each of these groups is active.



Basic forestry education in Sweden has been integrated with the general education system. It aims to provide five different levels of education as illustrated in the graph above. Only the forest worker and supervisor levels are discussed in this report.

2.1.1 Basic Education

The basic forestry education is designed to equip students with the elementary knowledge in all aspects of forest work they require in order to become forestry workers. More importantly, it provides a foundation for further training, i.e. forest foreman, machine operator. Subjects studied are machinery, forest production, logging, mensuration and wood technology, nature conservancy and general subjects.

The logging aspect of this training includes planning, felling, transport and forestry rationalisation. The students practice planning small felling areas in detail and they also learn to perform various felling operations and to drive different kinds of machinery.

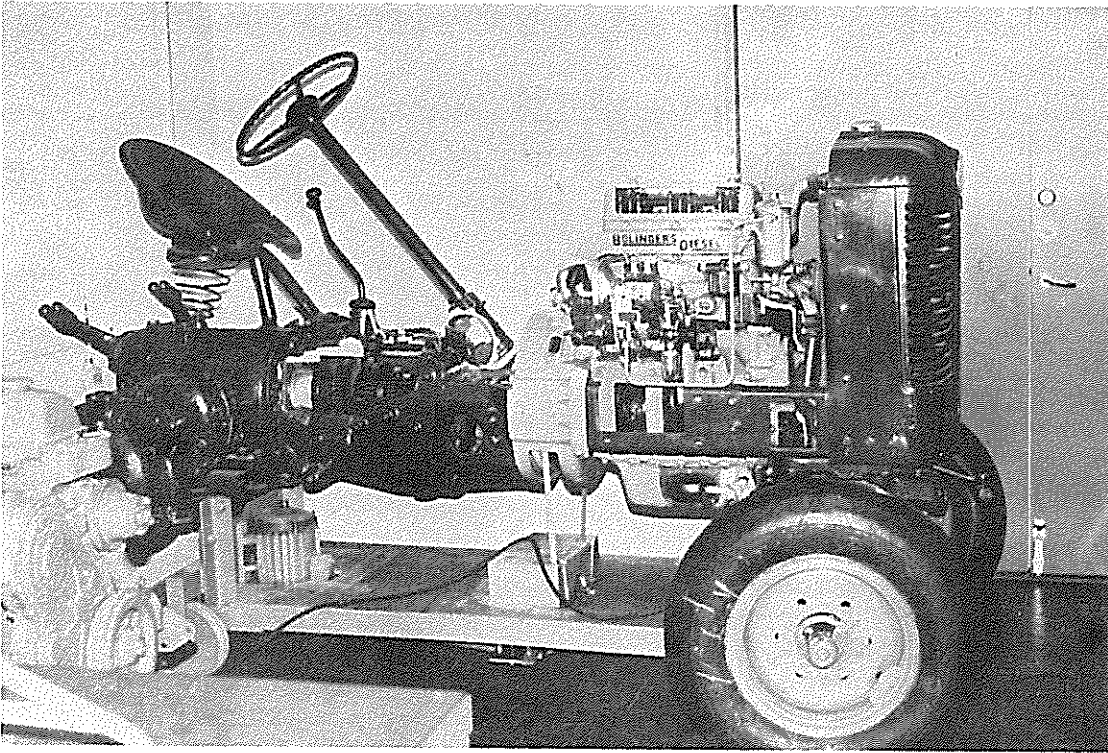
On completion of their basic training students can obtain employment with the Swedish Forest Service, private forestry companies or associations of forest owners.

2.1.1.1 Forest School at Södra Viken

The school is one of 26 of this type spread throughout Sweden. It employs 19 teachers and has an administration staff of 5. Course content of the main courses such as one and two year basic forest workers course are determined by the State through the National Board of Education. They also pay teachers salaries while building and equipment, etc, are covered by local counties. Course participants pay a token amount to cover their food and lodgings. The school has some 400 hectares of forest which it uses for training as well as access to private forest land. The counties interest is administered by an advisory board which also helps to decide what extra courses are needed, i.e. for farmers. The Board meets only twice a year and relies on the guidelines of the Headmaster.

2.1.1.2 Types of Courses Run

- (a) Two year basic forest worker course. This is the main function of the school and over two years it covers all basic concepts of forest work.
- (b) Basic course for forest workers, one year. Students must be over 18 years old. Covers similar material to that in course (a), only condensed.
- (c) Machine operators course. Normally for forwarder, but also covers basic skidder operation. This is a ten week course. The course content is shown in Appendix 1.
- (d) Foreman's course. This is 20 weeks for people who have done the basic one or two year course and may be a special course, i.e. forwarder operator, who wants to become forest foremen. They must have had at least two to three years practical forest work experience.
- (e) Farm forestry course. 15 weeks. This is for farmers who have agricultural backgrounds and want forest knowledge. The course concentrates on planning forest operations, the power saw, and the agricultural tractor. The latter are hired as required for the course, the school staff also travel out to the field to instruct these type of people as required.
- (f) Unemployed persons course. A ten week course covers all aspects of forest work up to and including forwarder extraction. This is a course for those people that have either been made redundant or cannot get work since leaving school. Applications are all screened by the schools, and are particularly difficult to get on.
- (g) Short courses. Several courses including :
 - improved economics (3-5 days)
 - crosscutting and timber measurement (one week)
 - release cutting techniques (one week)
 - winch thinning (one week)
 - mechanics for forest machine operators (one week).



Tractor electrically driven with all moving parts exposed.
Used as an aid to teach about the motor.

2.1.1.3 Equipment and Training Aids

Lecture Rooms

These are all equipped with blackboards, overhead projector facilities, video .8 and 16 mm and slide projectors, flip charts etc. They are large enough to comfortably hold 24 people. There are nine such rooms. There are also rooms with benches and vices and other tools for instruction in machinery maintenance as well as chainsaw service rooms, etc. A large garage serves as an area to carry out instruction work on machines. The garage comfortably holds four mini-Brunet size forwarders. The area is approximately 357 m².

Machinery

1. Forwarders. Nine in total. Three Brunet, three Skokums, one Osa, one Volvo and two old forwarders of dubious make. One skidder, four static cranes. These cranes are electrically powered with the option of six hydraulic controls or two under six electric over hydraulic.
2. Chainsaws. 70-80 partners. All are hired on a two year contract. When a basic forest worker is given a saw it is his until he leaves the school. It is his responsibility to maintain it.

Miscellaneous Aids

There is a multitude of various aids from a wide range of cutaway parts such as hydraulic banks, fuel pumps to an electrically powered tractor with all moving parts exposed.



A Forest School's machinery in Sweden. This is non-productive,
for training purposes only.

The school has various manuals as published by machine manufacturers, chainsaw companies, research organisations, such as Skogsarbeten.

Films and slides are obtained wherever they can.

Ergonomic equipment, i.e. pulse rate counters, decibel recorders, etc. They also have an exercycle to simulate a tired working person.

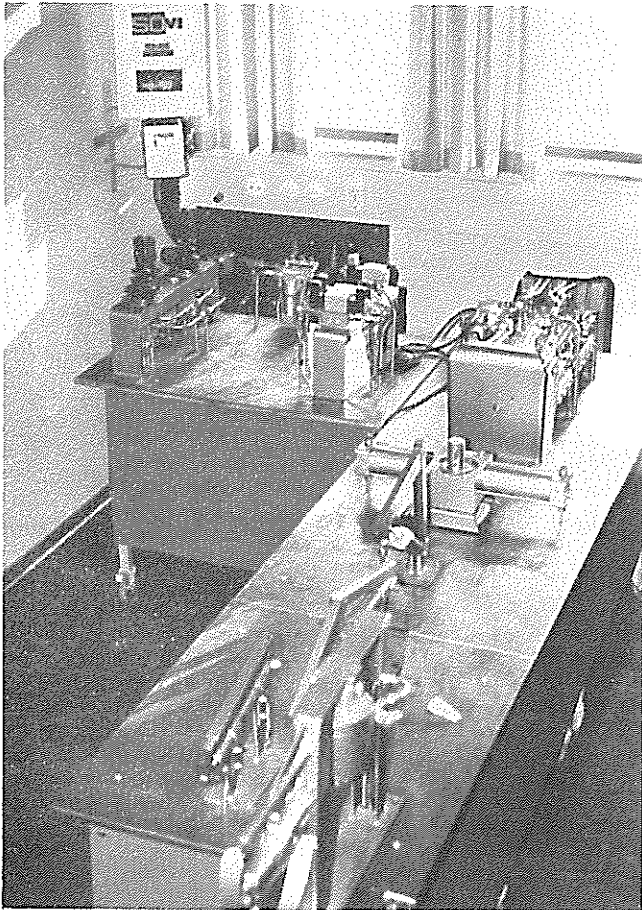
Simulators. These can be used to simulate faults on hydraulic systems or electrical systems, and can be used for students to practice connecting systems up.

2.1.1.4 Discussion

This type of school lays down a solid foundation for further training. A person who before starting work who has completed the two year basic course has an excellent appreciation of the effect of his work on the total scene. It also means that the forest management has more flexibility when planning forest operation, if all forest workers have had a similar basic training.

2.1.2 Instruction by Forest Companies

During the study tour in Sweden several companies were visited to give a balance of their reaction to the basic training system and the training offered by machinery manufacturers. The size of some of these companies meant that the size of their training organisations was often catering for more people than a basic forestry school. The table below outlines the size of some of the larger companies.



Simple hydraulic simulator.

<u>Owner</u>	<u>Area</u> (⁰ 000 ha)
Domänverket	4,110
Svenska Cellulosa	
AB-SCA	1,692
Mo Och Domsjö	
AB-MoDo	638
Korsnäs Marma AB	519
Stora Kopparbreds	
Bergslags AB-Stora	784

2.1.2.1 Swedish Forest Service - Domanverket

Domänverket is by far the largest company and has its own training branch set up. The school, with its associated lecture room and machine halls, is situated at Färna, approximately in the middle of Sweden. It employs a headmaster and two other instructors on a full-time basis. Use is also made of instructors from various manufacturers which may be hired for a specific course. The emphasis at the Färna school is placed on the training of



Static cranes for training forwarder operators.

technical personnel, i.e. drivers and cutters. Attention is also paid to the training of office staff.

The total training time per year is 18,000 days, it includes machine courses held in conjunction with the machine manufacturers, Skogsarbeten courses, and any they do at Färna. This includes between 650-900 people through Färna centre per year. The following table is a list of courses offered by Domänverket.

<u>Office Staff/Administration People</u>	<u>Technical Personnel</u>
Basic training	Instruction Methods
Administration	Brush up course
Leadership	Foresters
Collaboration	Instructor training machines
Conference Training	Instructor training cutters
Accounts	Safety delegates
Planning	Safety supervisors
Wood and Technique	Basic training drivers
Pedagogy	Maintenance machines
Routine Invoice	Hydraulic course
Routine Payment	Electrical course
	Course for crane operators
	Brush up course for cutters
	Brush up course for instructors
	Course for workshop personnel

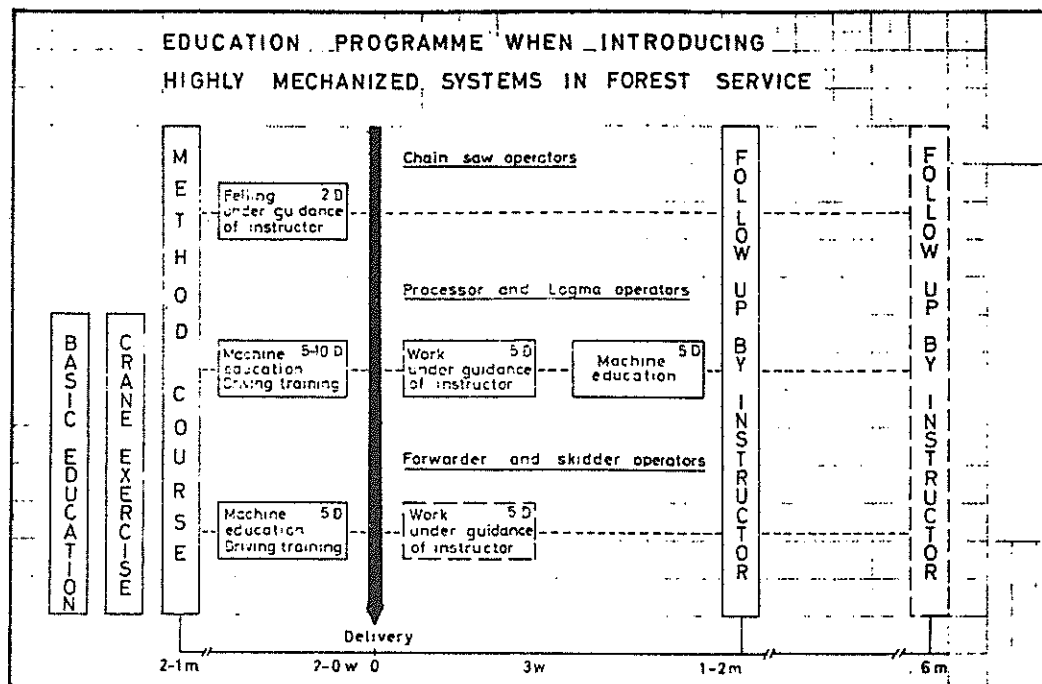
This illustrates the wide range of courses offered. People normally have to travel to Färna to attend these courses rather than the instructors travelling out to the field. These courses are also available to other company people at a cost. The length of the course varies from basic machine training (drivers) eight weeks, to special course for spare parts people, three days. Most, however, are between one and three weeks long.

It is interesting to look at Domänverket's schematic approach to the introduction of a highly mechanised logging system. This is a good example of the level of training and who does what.

EDUCATION PROGRAMME WHEN INTRODUCING HIGHLY MECHANISED SYSTEM IN FOREST SERVICE

	<u>No. of Days</u>	<u>Time Before Start</u>
Information -		
Forest Officer		
Assistants	1 day	1 year
Forester		
Method Course -		
Forest Officer		
Assistants		
Foresters	3 days	1-2 months
Cutters		
Machine Drivers		

If an operator had done two year basic training plus ten weeks machine operator course, as well as doing what is prescribed here by the Forest Service, he will have been trained for a total of some two years and three months.



Training for levels this high or course lengths this long is often very hard to justify. The table below certainly does more than justify this level of training. It illustrates what happens if you don't train or become complacent.

The table below compares performance of grapple loader operators before and after five days training.

"Skilled" drivers, 2-9 years practice on the grapple loader and beginners.

Name	First Time (Load your own way)	Percentage Reduction	After Course (one week)
J.S.	6.50	20%	5.25
H.R.	6.25	30%	4.40
G.O.	7.05	23%	5.45
L.E.	9.32	56%	4.15
O.P.	7.51	45%	4.15
(R.R.	17.45	54%	8.10
* (R.E.	10.00	48%	5.20
(K.T.	16.43	54%	7.55
H.S.	8.38	62%	3.25

* These men had no previous training.

2.1.2.2 Storacopparberg

The approach to training by this company is similar to the previous one, only on a slightly reduced scale. Two instructors are employed on a full-time basis, as well as one mechanic being seconded with up to three others depending on requirements. As well as these there are numerous courses they purchase from Skogsarbeten to show their instructors what's required and they then take over.

The emphasis on machine operator training has been to increase the skill of the operators to read schematic diagrams of hydraulic and electrical systems. This is in an endeavour to have the operators more involved with fault finding and the move towards him doing more advanced repairs on his machine in the bush. Two drivers per forwarder are trained while for processors and harvesters three drivers are selected and trained.

It is worth looking at the table from the report on training in the 1981 Storacopparberg Annual Report.

Training Report 1981

<u>Categories</u>	<u>Training days Total</u>				<u>Training days per</u>			
	1981	1980	1979	1978	1981	1980	1979	1978
Forest Workers (20515 hrs)	2574	2670	1684	2451	2.2	2.3	1.4	2.1
Supervisors Forest Staff	1117	1206	638	462	4.1	4.4	2.5	1.8
TOTALS (28837 hrs)	3691	3876	2322	2913	2.6	2.7	1.6	2.0

It is worth noting that their total number of employees is 1,170 in the forest sector, including administration staff. An excellent costing of this training has also been done. In 1981 the total cost of the training was 1,512,752 SEK (NZ\$330,172) or 510 SEK (NZ\$89) per training day.

2.1.2.3 Korsnäs Marma

This company employs some seven instructors on a part-time basis. These men are an integral part of the production team and may only be used on instructional work for 5% of their total time. Being part of the production team, and they are normally the best men, supervisors don't like them being taken out of the work situation.

Korsnäs Marma has employed a freelance instructor for up to seven weeks to help overcome this problem. He has three or four different assignments while working for this company, including a course on the use of a brush cutter and the formulation of the slide tape series on correct felling techniques.

The concept of a freelance trainer is a good one and this year this particular trainer will spend upwards of 100 days working for various companies. The majority of his training is done in the field.

2.1.2.4 Discussion

This section clearly illustrates that the training at the Forest Workers School level is only the beginning. The commitment by the forest company is impressive. This will be further discussed in the final discussion at the end of this section and further reasons given for this high level of training. It is important to remember that the three companies mentioned here harvest more wood per year collectively than does New Zealand's total industry.

2.1.3 Instruction by Machinery Manufacturers

This section has been divided into two, small machine manufacturers, Husqvarna, Nordfor and large, ÖSA and Kockums. The middle range machines, such as forwarders, skidders, are catered for by the forest schools and various forest companies as previously explained. For economic reasons training for operators of machines such as processors and harvesters where a machine must be on hand during the course is done by the manufacturers at schools close to their factories and testing areas.

It is the training offered by these companies where the real versatility of the Swedes and training becomes apparent. Courses are offered to countries throughout Europe and even as far as Canada, Australia, New Zealand, U.S.A. and South Africa.

2.1.3.1 Training by Husqvarna and Nordfor

These two companies are under the Electrolux group. They concentrate their training effort mainly on the motor manual systems and aspects related to this.

Husqvarna mainly demonstrates models and the recommended use of these. This is done at the forest schools, companies, as well as for different countries. They also develop interesting slide tape/manual programmes which are used as an aid to training by various schools etc. Some instructional work is done on a sales type deal, i.e. a sale of 200 saws may be made to an undeveloped country, part of the sale will be the training of instructors. Two to three weeks will be spent training them. However, with little or no follow-up, in a short time, two to three months, bad techniques quickly creep in.

Nordfor training activities started with chainsaw operator courses at a number of Swedish forest companies. This has now widened to include training of company instructors, supervisors, machine operators and clearing saw operators. From the mid-70's there has also been a thrust into the area of overseas training, mainly in Europe, Africa and North and South America.

The instructors in Sweden tend to operate on a similar basis as the freelance instructor described in section 2.1.2.3. They don't have much in the way of formal instructional material for hand-outs etc. The philosophy here is that little or nothing of this type of material gets read after the course anyway.

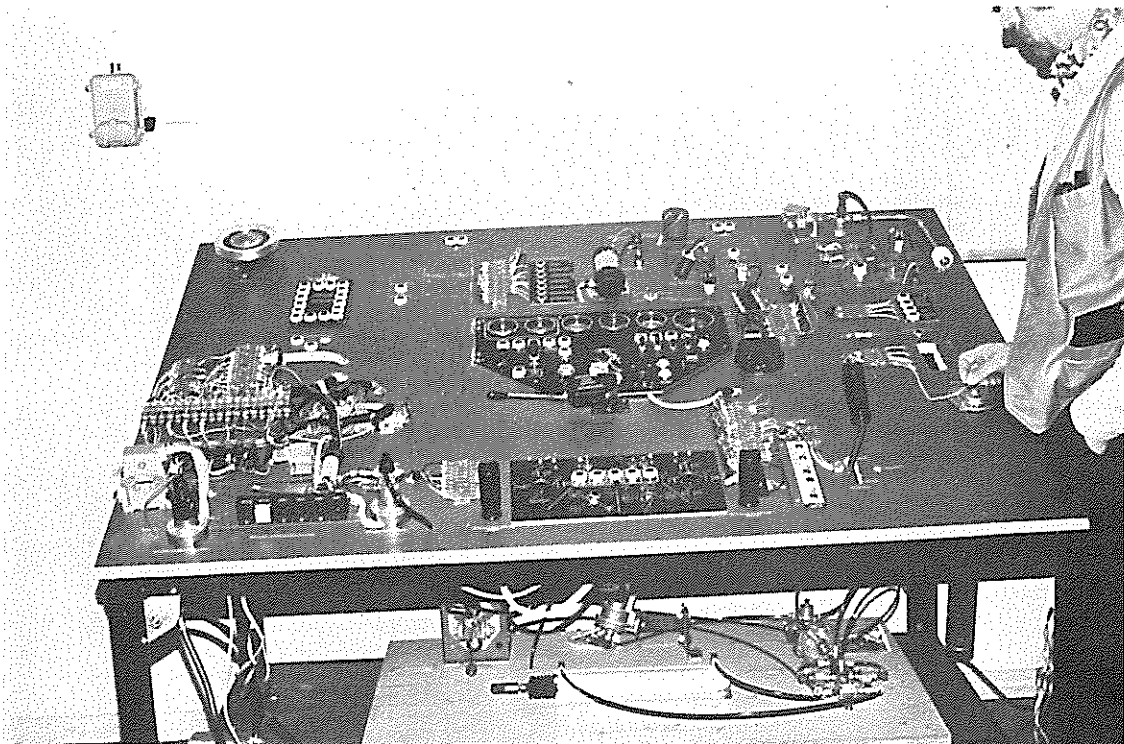
2.1.3.2 Training by ÖSA and Kockums

Two of the large machinery manufacturers were visited, ÖSA and Kockums. Their respective approaches to training were quite different. In both cases the price paid for the machine or machines, included a pre-determined amount of training. Normally three weeks at each ÖSA or Kockums schools plus one week follow up about six months later. In the case of Kockums training was only offered for specialist machines, feller bunchers, harvesters, processors, with the minimum pre-educational requirement being the ten week basic forwarder course as in the forest schools or four to five years practical experience on a forwarder. ÖSA offered the forwarder course as well as the specialist courses. Operators, foremen/supervisors, and servicemen are all trained. Both companies use the actual machine as an aid as well as hydraulic and electrical simulators.

The ÖSA school is a very modern, most impressive set up, with three large lecture rooms, plus two machine halls. They have between 600 and 700 students through the school annually, coming mainly from Scandinavia but also from European countries as well as Canada and the U.S.A. They use special non-productive machines for training.



ÖSA machine operators schools machine hall enables work to be carried out on machines even in worst weather.



Manufacturers simulator for training in hydraulic and electrical repairs on a Processor.

Kockums uses the purchasing company's new machine and the school hall facilities are not as impressive as ÖSA's, thus there is a tendency to include more actual on the machine training.

Kockums have also trained one of SCA's operators as an instructor. He now does a large percent of the instruction for this company. Courses for forest foremen/supervisors are designed with consultation between the instructors and the company concerned.

2.1.3.3 Discussion

To train operators for machines as complex as these is very expensive. Just to have a machine of the size and cost of these idle for three weeks is enough. But as well as that each new model change means that a new simulator needs to be built. On the other hand, a lot of expense at this stage saves a far greater amount later in the machine's life and downtime can be reduced and operation made more efficient.

The consulting type of training as done by Nordfor Husqvarna has been tried in New Zealand previously with only limited success. This can, in the main, be attributed to the lack of follow-up when instructors leave the country.

2.2 NORWAY

Background

The Norwegian Forest Industry is much smaller than Sweden's with a total productive forest area of only 6.5 million hectares. The ownership is very fragmented with 83% of this area privately owned. The total number of forest owners with less than 2.5 hectares is 120,000, with a further 38,000 owning holdings between 2.5 and 10 hectares. This fragmented ownership poses some interesting training problems which have been overcome well by the setting up of the Forest Extension Service Institute.

Norway harvests 8.5 million m³ per year mainly from clear cutting operations (97%). By far the main type of extraction unit is the agricultural tractor which is used for forestry and farming. Approximately 25,000 units.

The State run training system in Norway is outlined in the table below :-

<u>Level</u>	<u>No. of Schools</u>	<u>Students per Year</u>
University	1	30
Technical	3	60
Ranger	3	70-80
Worker	3	150 (1 yr. course) 200 (shorter course)

2.2.1 The Forest Extension Institute

The Institute was founded in 1958 at the initiative of the Norwegian Forest Association. Its purpose is to give follow up training to forest owners, forest technicians and engineers. The Institute is funded by public grants and by fees paid by the course participants. It is run as a business proposition. The permanent course centre at Biri has 39 fully equipped bedrooms similar to hotel accommodation, three large conference rooms and six group rooms. It has an internal television system with permanent taping and replay possibilities at several locations. The conference rooms are equipped with modern audio visual instalments.

The Institute is administered by a board of representatives, one person from each of the 30 companies. They have a further Board of Directors which consists of five persons plus one representative from the Ministry of Agriculture. Advisory boards assist in drawing up projects for the coming year. There are three groups in this Advisory Board, training forest workers, training forest owners and post-education education for forest technicians and professionals.

The staff at the Institute consists of, Director, 2IC, plus eight professional staff developing programmes and running courses.

Courses run at the Institute are varied, but range through topics such as one major seminar per year, for forest owners, planting, thinning, improvement of conditions for logging in deep snow, extraction with skidder, ground course for forest legislation, cross-cutting and volume/value recovery, through to planning of the moose population. Some courses are only run once, others may be run three times per year. The courses are a maximum of one week but mostly two or three days. The number attending a course depends on the course but eight is a minimum. On average about 35 per course. In most cases one person from the Institute is on each course. His responsibility is to select a topic, plan schedule, prepare course and deliver course.

Excellent use is made of outside expertise, i.e. other extension agencies, university lecturers, research people from NISK (Norwegian F.R.I.). Last year almost 300 outsiders were used to assist with courses. They were all paid for by the Institute. The use of outsiders goes to the extreme of flying 12 Skogsarbeten researchers (from Stockholm) to the Institute for two days presentation.

2.2.1.1 "Activity in Forestry"

Activity in forestry is a co-ordinated project and training and education of small scale forest owners and forest workers. It is run jointly by the Ministry of Agriculture, the Department of Forestry, the Norwegian Forest Owners Federation and the Forestry Extension Services Institute. The programme consists of a number of short courses in logging operations and silviculture. Each course deals with a limited topic but together the courses are intended to cover important fields in forestry. Practical training is given priority. The courses are offered in districts all over the country. During the first two years of this scheme some 6,600 participants went on 900 courses. To handle such large numbers a network of 77 instructors has been set up. These instructors are all trained at the Forest Workers School at Sonstrud. This instruction takes four weeks plus, after six months work, they return for two or three days to discuss experiences. The instructors are retained in the workforce and when not instructing continue their normal duties. An instructors course is laid out below.

Instructors Course

No. of Participants - Eight persons divided into two parties of four.

No. of Teachers - One chief instructor and one assistant instructor. The latter may well be a person who has previously attended a similar course.



Students being trained in the use and operation of agricultural tractors.

- Duration - Four weeks, arranged as follows:
Two weeks at the professional training centre, two weeks of self instruction at home, followed by two weeks at the training centre.
- Contents -
1. Care and maintenance of the chainsaw and personal safety equipment, approx. 30 hours.
 2. Working technique, training in safe and physiologically correct working motions, approx. 12 hours.
 3. Planning of work, demonstration of proper working conditions and delimbing operations, approx. 46 hours.
 4. Instruction technique, approx. 72 hours.

45% of the time is spent on instruction technique and 55% on self perfection.

Instructors can be trained in the following specialist areas :

Chainsaw care and maintenance and working technique, four weeks.
Logging with farm tractor, four weeks.
Cable crane, two weeks.
Thinning, three weeks.

No instructor can hold a course in an area he hasn't had specialist instruction in. Payment of these instructors is by the course participants. While they are being instructed by the Institute, the Institute pays their wages. The instructors are examined at the end of their course. This takes the form of a presentation of part of the course to an audience consisting of representatives of forest owners, the union, the Institute and forest press etc.

2.3.1.1 Course Detail

(a) Basic Year in Forestry :

This is concentrated on the fundamentals of forestry and forest industry activities. The aim is to give knowledge and skills which will be needed during the continuation of studies and to teach wood and tree species identification, as well as to give general idea of fields concerned and the occupations involved.

General subjects - 395 hours
Physical training and occupational health - 190 hours
Forest machinery - 120 hours
Forestry and forest industry - 210 hours
Wood production - 240 hours
Timber harvesting - 305 hours.

70% of this time is in the classroom.

In the final phase of the basic year the forestry students are selected for the specialised courses, during which teaching is concentrated on the knowledge required for the specialised areas.

(b) The Forest Worker:

Comprises primary timber conversion, artificial reforestation, young stand treatment and other activities of annual work cycle. This specialised course lasts one year, divided into the following main groups.



Forest workers felling skill being assessed.

General subject - 205 hours
Physical training and occupational health - 135 hours
Forest machinery - 150 hours
Wood production - 380 hours
Timber harvesting - 590 hours.

70% of this work is done in the field, 15% in the classroom and 15% in other practice.

(c) The Forest Machine Mechanics as illustrated in the table

These can come from either the mechanics vocational school or through various basic forestry lines. The course lasts two years and comprises the following main groups. General subjects, applied mechanics, repair and service techniques, practical training. This also includes driver training.

If a course is required for harvesters or processors, rather than the companies doing this they arrange for a machine to be available at the school. In the machine operators course, the ratio of people to machines to teachers is in the classroom, one teacher per machine with two pupils, and in the field, one teacher, three machines and two pupils. Crane operator training is done using similar cradle exercises as in Sweden. The emphasis being on correct technique rather than speed.

The schools equipment is very similar to Sweden's, with lecture rooms, large machine hall, cut away parts etc. The schools also have their own, or have access to, areas of forest land.

All students are tested at the end of their respective courses. The felling and delimbing test is along the lines of the rules for the world championships felling competition. The machine operator, things like having all the pieces of wood stacked evenly, no ends protruding further than 10 cm out of line, ability to operate, fault find and repair, etc. Wages are fixed on the students who have passed the exam being paid more. If a section is failed it can be re-sat at a later date out of sequence.

2.4 BRITAIN

The forest industry in Britain is smaller than in any of the other countries covered so far. Their approach to training is on an extremely mature level taking basically what is done in Sweden and modifying it to fit the British situation.

The total area of productive woodland in Britain is only 1.8 million hectare of which 367,000 hectares is broad leaf species, mainly found on private estates and 1.4 million hectares of conifers, Norwegian spruce, Sitka spruce, Douglas fir and *P.silvestris* of which 849,000 hectares is owned by Forestry Commission and 529,000 by private ownership. The total volume removed per year is 4.6 million m³ of which 3.4 million m³ is from conifer. Wood is extracted using both shortwood and tree length systems. The shortwood, with the increasing swing towards forwarders, is most popular.

The Forestry Commission is very similar in set up and running to the New Zealand Forest Service.

2.4.1 Training

Training in Britain is on basically three levels - University, Technical, similar to N.Z. Forest Rangers Certificate, and forest worker training. Only the forest worker training is dealt with here. The level of forest worker training is somewhat different to Scandinavian approaches. There are no schools as such for school leavers wishing to become forest workers. Most of the basic instruction is done in the field or on

short courses as run by the various training schools. More advanced instruction of machine operators, forwarder or skidder, is done at one of the two forest machine operator schools. Structured course for the likes of basic chainsaw techniques, advanced chainsaw techniques and cable crane operation are done on the operators station or in a central forest where a group of trainees can be assembled.

The machine operator training centres are located at Ae in southwest Scotland and in South Wales. These two centres train all required operators for the Forestry Commission.

A further factor important to the question of training is that Britain has legislation which stipulates that adequate training must be given to all new employees. While this isn't the whole answer in assisting the setting up of training systems, it is certainly a great help.

The training referred to in this section is all done by the Forestry Commission.



Example of high felling and delimbing standard achieved.

2.4.1.1 Instructors

The most important part of any training is the instructor and his attitude to the job he is doing. In Britain the people selected for this position were some of the best motivated people in the industry. The instructors are usually qualified foresters or forest technicians (forester = N.Z. Ranger). Although the instructors at the Ae machine school consisted of two foresters, two with mechanical background and one operator with mechanical apprenticeship. These instructors are seconded from management ranks for periods of five to seven years, thus there is no time for an instructor to become bored. There are exceptions where an instructor may be left in for longer periods by request.

The instructors are selected by themselves being put through a trainability test and a competitive interview. Once selected they are given specialist training in the areas which they are to instruct in and a two week course run by another government agency on how to instruct. They may also be sent to Sweden or other such countries to go on a course if new machinery is purchased. One to two weeks per year is spent learning new skills and updating on developments. The Commission employs a total of 24 instructors spread throughout Britain.

2.4.1.2. Ae Machine Operating Training Centre

The Ae centre is mainly concerned with the technical training of Forestry Commission operators, supervisors and managers who are responsible for the use of machines such as forwarders or skidders.

The table below outlines the courses and the levels at which these courses are aimed.

Courses Run by Machine Operator Training Centre

<u>Supervisor Training</u>	<u>Operator Training</u>	<u>Mechanics Training</u>
Skidder extraction	Skidder extraction	Courses for all machines
Grapple loading and hauler extraction	Forwarder extraction	Hydraulics course
Supervisor technical update	Mechanical loader	
Forwarder extraction	Grab saw	
Grapple loading	Processor	
Skidder extraction		

These courses are actually carried out at the centre and in the adjacent forest areas. The following courses are on-site forest worker training, by regional trainee staff.

- Tariffing and thinning control
- Rack layout and tariffing
- Maintenance, repair and adjustment with chainsaws
- Chainsaw techniques and working methods for fell/slash/delimb and crosscut
- Chainsaw techniques for taking down hanging trees
- Chainsaw techniques for harvesting and wind blow.

Course duration is much more flexible than in Scandinavia. It depends on the complexity of the skills required to operate a machine and the aptitude of the

operator under training, i.e. up to a maximum of five days for a skidder operator, and 15 days for forwarder operators. The school's area from which students come is the whole of Scotland and the northern two conservancies of England.

The course content for the operators is not as high as Sweden's for example although it is basically based on Sweden. They use similar crane exercises, these are timed and there is a target time to be reached. The mechanical theory is more where things are and what they do than how and why they do it. The course sequence is basic theory - yard training (simple driving exercises) - crane exercises (in yard) - forest (familiarity with handling machine) - extraction (pulpwood and logs) - driving on difficult terrain.

After this training there is a period of consolidation for the operator to get used to the machine and a follow-up of one or two days is done where the instructor observes and discusses various aspects of operation with the operator. During the course at Ae the instructor/operator ratio is kept to a maximum of one to two, preferably one to one.

At this stage only sufficient operators have been trained as are required for the machines. There is no reserve of operators.

The Ae school has the following facilities and equipment :

- Lecture room to cater for a maximum of 12 persons
- Workshop large enough to house mini-Brunet size forwarder
- Standard supply of movies, slide tape presentation, handbooks, manuals, etc.
- Two Brunet forwarders or whatever forwarders operators are being trained for
- Skidders.

2.4.1.3 Cable Crane Course

During the visit to Britain I was fortunate enough to be able to attend for one day one of these courses. The course runs for four weeks and consists of one week theory, two weeks setting up and taking down the machine, and one week pulling wood. This is followed by the participants returning to their stations for a six week consolidation period. The courses are restricted to four students. In the first week there is one instructor but in the second, third and fourth weeks there are two instructors and two haulers (Smith's Timbermaster in this instance). Where possible it is preferable for the students to be in pairs, i.e. two from a station who when they return will work together.

The first week covers such things as the hauler and its moving parts, this is for the operators to understand the mechanics of the hauler, daily/weekly maintenance, controls of the machine, etc.

Rigging - this covers things such as different carriages and when to use what sort of wire rope sizes and gear, how to correctly raise and lower the tower, etc.

Setting up machine - covers the theory behind the reasons for guy placements, tension and deflection, rigging tail hold trees, rigging intermediate supports.

Splicing, wire rope and polypropylene - this need not be done in the first week but may be left for a wet day later on in the course.

The second and third weeks are for the machine rigging practice. Here there are two machines available and the students rig and de-rig the machines in different settings for the full two week period. At this stage there are two instructors on hand. The rigging includes full layout down to attaching the carriage and setting intermediate supports.



Course participants and equipment. This equipment is used for training purposes only.

The final week is for the students to actually operate the machines extracting timber. A turn-about system is operated where one will spend half a day operating and the other will break out. They normally swap over at lunchtime.

On the completion of the four weeks the trainees return to their forest and undergo a six week period of consolidation. There are no production levels to reach while this is being done. The consolidation period is essential to the worth of the trainee.

2.4.1.4 Instructors Manuals

Little in the way of prepared material is given to the students on the completion of their course as the feeling is that it doesn't get read anyway. The instructors, however, have very comprehensive manuals which they use as a guideline in running courses. One person has responsibility of developing these manuals. The manuals are written setting out in detail the objectives and content of each course. Example : the Commission decides to purchase three wheeled motor bikes for use by Game Keepers. These are initially evaluated by the work study branch in conjunction with the proposed users. The manual developer and an instructor and someone from the users then decide what those using them should know about them, i.e. motor, daily service, how it works, fault finding repairs etc etc, operation limits, slope limitations, load limitations, safety, technique of operation.

The manual is then written deciding course length, in this case three days, and at the end of the course the trainees should have reached such-and-such a standard or level of knowledge.

Examples of these manuals are held by LIRA, or ones for specific courses can be obtained from the Forestry Commission for a nominal fee.

2.4.1.5 Skills Tests

Skills tests are used for two reasons, (a) to check the trainees progress, and (b) to check the instructors technique.

At predetermined places in a course there is a skills test designed to assess the trainees grasp of what he is being taught. Successful completion allows him to move on to the next area of training. If he fails however the trainee is told why he failed, the instructor then demonstrates the correct technique and helps the trainee achieve the required standard. After further practice the test is re-applied. Repeated failure indicates that the trainee is incapable of performing to the required standard, or it may be the instructors technique is not up to scratch.

This technique controls the progression through a course and for a rapid learner being trained on a one to one basis frequently reduces the course time required. It isn't as easy to cater for a rapid learner in a one to six situation. However, the use of trainability testing has allowed men of similar levels to be streamed together thus enabling a reduction in course time.

2.4.1.6 Trainability Testing

Trainability tests were first developed by the Industrial Training Research Unit, Cambridge, England. They have been used successfully by a number of companies in the U.K. and a wide range of industries as an aid to recruitment selection. The job specific tests are designed to assess the applicants potential to be trained. Each test requires the applicant to perform a task in which he has been given prior instruction.

Considering the improved efficiency of selection in other industries the Forestry Commission developed tests for forest workers. Three tests have now been developed - chainsaw operators, forwarder operators and skidder operators.

Each test is designed as follows :

- (a) Identify the key operations and skills which are required for successful performance
- (b) Select a work piece or task which requires the performance of these skills and operations
- (c) Compile a list of errors which are known to occur when learning the task
- (d) Select the range of ratings and write guidance notes for the instructor on their use
- (e) Design and write the instructors script for the standard piece of instruction.

Errors made during the tests are recorded and afterwards the instructor makes a subjective rating on the performance which takes account of the applicants attitudes (interest in the work and the effects of nervousness on his performance). Personal bias is minimised by careful choice of an appropriate range and description of rating. It is critical that the instructors taking these tasks are of the highest calibre to be able to compensate for this question of personal interference.

The trainees are rated A to F - A being the best, say only three or four mistakes out of a possible 42. This can be further monitored as during the training the trainee is assessed on a scale from A to F also. This is based on the skills test and carried out by a different instructor to the one which did the trainability test.

The following chart is the expected distribution of proficiency grades. On the left hand side is the trainability test and on the right hand side is the trainers test. This chart shows results of chainsaw operators only.

Chainsaw Operator

<u>Trainability Test Error Score</u>	<u>Trainers assessment during training Percentage distribution</u>				<u>Trainers Test Assessment</u>				
0 - 5	A10	B45	C45		A	A50	B50		
6 -10	A5	B35	C45	D15	B	A5	B55	C35	D5
11 -15	B25	C50	D20	E5	C	B15	C60	D20	E5
16 -20	B10	C60	D25	E5	D	B10	C40	D40	E5 F5
21 -25		C50	D40	E10	E		E100		
26 +		D50	F50		F		No data		

The shaded areas indicate insufficient data available.

A trainability test provides a practical means of selection of recruits for a specific job. Assessments are made of the skills held by applicants and their ability to learn new skills. The tests offer an opportunity for line managers to use specialist skills of the trainers in the selection of employees. It can only be a guide and the final decision of who is to be trained remains that of the managers.

Cost of Training :

The British Forestry Commission has undertaken an excellent costing exercise on the cost and benefit to the industry of training. The table below illustrates how much it costs to train a chainsaw operator/m³. From this it is clear that if an increase of only 1.7% can be achieved this cost easily justifies itself. This is a very small increase to ask for and should be relatively easy to achieve.

Cost

<u>Training costs</u>	<u>Course days</u>	<u>Instructor cost at 80/day</u>	<u>No. of trainees</u>	<u>Instructor cost</u>	<u>Training costs Wages & Oncost</u>	<u>Travel etc</u>	<u>Machine Costs</u>	<u>Total Training costs</u>
C/saw	10	800	6	135	300	20	40	495

Output

Sawyer, say	1,500 m ³ /yr
Skidder, 3.5 m ³ /hr x 1200	4,200 m ³ /yr
Forwarder, 6.0 m ³ /hr x 1500	9,000 m ³ /yr

Training cost m³ spread over life of one machine

C/saw	495	over	3 yrs	4 yrs	5 yrs	Av. costs m ³	Improvement required
	1500		11p	8p	6.6p	3.90	1.7%

CONCLUSIONS



↑

An example of the high standard of felling presentation achievable by a commitment to training fallers.

←

The commitment to training by manufacturers has enabled the development of sophisticated machines such as these.

From this study tour it has become apparent that if New Zealand is to meet the challenge of a threefold increase in production, we must establish basic forest worker schools for school leavers. It is equally important that these school leavers should be taught a full range of forest activities from land preparation to logging, to give a good insight into the effect each operation has on the others. This also serves to better motivate workers for the jobs they are to undertake. This basic school cannot be the end, it must be followed up with further in-house training by forest companies for specific tasks. There needs also to be a more responsible attitude adopted by machine sales houses, i.e. it is not enough to sell a machine, it should further be followed with a comprehensive operator's manual and, where required, training and how to read and use this manual.

The facilities and equipment required for such training institutions are high and will mean a large investment. It is important that this investment is made as its benefit will soon be realised. There is also a need to attract open minded, well motivated people to the role of trainers. This may well be done on a secondment arrangement. The ratio of instructors to students is critical, and should never be less than one to six in a field training situation, and lower wherever possible. Skills testing of students throughout their training is an ideal method of ensuring that they, and the instructor, are realising the full benefits of the knowledge to be passed on.

The role of research organisations in ensuring that new developments and techniques are passed on, cannot be over-stressed. If this is done it will be of benefit to all the industry and ensure that the transition into the large increases in productivity during the next 20 years is undertaken smoothly.

APPENDIX I

ITINERARY

1982

- March 2 Arrive Stockholm
2-5 Extension services Skogsarbeten, Stockholm
8-9 Training of forest workers in the upper secondary school Södra Viken.
10 Skogsarbeten conference at Karlstad
11-12 EMAB (Husqvarna) companies in Jonköping - training aids and techniques
15 Attend one day of "The Forest Week", Stockholm
16-18 Course arranged by Skogsarbeten on cross-cutting at Ljusdal
19 Forest company Iggesund - training facilities
22-23 The ÖSA Machine School - Alfta
24-25 The Kockums machine operator training, Söderhamn
26 Forest company Stora Kopparberg - training facilities at Falun
29-30 Domänverkets (Forest Service) training centre at Färna
31)
April 1) Nordfor Teknik, Säter - training aids and techniques in field
2 Film/slide-tape presentations by Skogsarbeten, Stockholm
3 Travel to Helsinki, Finland
4 Introduction to extension carried out by Metsäteho
4-6 Machine operators school Jämsänkoski
7-9 Extension by Metsäteho, also attended a course on the use of computers to predict wood purchase
13 Extension Skogsarbeten Stockholm
14-15 Freelance instructor in operation at Gävle
16 Wrap up with Skogsarbeten, Stockholm
18 Travel to Oslo, Norway and on to ÅS
19 The role of the Norwegian Forest Research Institute, N.I.S.K.
20 Logging operations at Hurdal experimental Forest run by N.I.S.K.
20-21 Extension Institute of Norway Honne Biri
22 Forest workers school at Sonsterud
23 Forest company - Glommen Skogeierforening extension and training
24 Oslo to Glasgow, Scotland
26 British Forestry Commission offices at Edinburgh
27-30 Machine operators school and Forest Management School at Ae
May 2 Travel to Inverness
3-5 Work study team Inverness - research techniques and extension
6-7 Two days spent attending Timbermaster cable crane course at Strathyre
9 Travel to Dumfries
9-14 Attended ECE/FAO/ILO seminar on "The Management of Forest Worker Training" at Dumfries as New Zealand delegate.

End of study tour, travel London to Auckland.

APPENDIX II

REFERENCES

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4. Davies, R.D. The principles and practice of forestry training course design in the Forestry Commission of the United Kingdom. ECE/FAO/ILO seminar on the Management of Forest Worker Training, May 1982. Restricted TIM/EFC/WP.1/SEM.13/R.4.

APPENDIX III

SUMMARY OF RECOMMENDATIONS FOR N.Z. INDUSTRY

1. The similar levels of production of Norway, Britain and New Zealand was striking, however, the level of investment in research and development, extension and training, leave New Zealand looking sadly lacking. Groups and organisations such as Forestry Council, Forest Owners and the Ministry of Forests, need to recognise the massive expansion due in New Zealand and take appropriate steps to remedy this imbalance in the areas mentioned above.
2. Research organisations, such as LIRA and F.R.I., need to put increased emphasis on more professional approaches to the transfer of technology. This is an area where great gains are possible if existing technology is known and used.
3. LIRA needs to disseminate its research results as quickly and effectively as possible, ensuring that the right people are made aware of research being undertaken. This could be easiest started by more well organised and professionally illustrated field demonstrations.
4. A closer liaison must be established between the research (LIRA and F.R.I.), and training branches (L. & F.I.T.B. and company training teams), of the industry, if new technology is to be correctly applied and if the two types of organisations are to fulfill their respective roles effectively.
5. Finally, and most importantly, consideration should be given to extending the depth and width of worker and operator training for the logging industry within 12 months. Depth by reaching down to school leavers, and width by extending the range of operator training on a basis more widely available to industry. The Education Department and the machinery sector could be enlisted to help other bodies, such as those mentioned above, achieve these objectives.