Session (7)
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TRAINING HARVEST PLANNERS

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Introduction

The New Zealand forestry sector has demonstrated a range of formal instruction in harvest planning. This has included:

- Harvesting modules within the NZ Certificate in Forestry;
- Harvesting papers within the forestry degree courses (including the combined forestry - engineering degrees);
- LIRO courses in harvest planning; and
- The NZ Forest Engineering Institute (NZFEI) course.

The list is not exhaustive. The increasing popularity of forestry courses at polytechnic level, for instance, has involved aspects of harvest planning being taught in these. Components of the subject are also addressed in short courses such as the software courses, environmental workshops, cable logging and business of logging courses. The Logging and Forest Industry Training Board has provided more direction and rigour in operational harvest planning.

The New Zealand industry has sought instruction from offshore. This has particularly included degree courses at universities of the Pacific Northwest, and the original Forest Engineering courses held at Oregon State University.

Obviously, not all of the training is formal; a very significant proportion of the skills may be learnt on the job.

Scope of Training in Harvest Planning

The capabilities we might aim to establish through training in harvest planning are suggested below:

Analytical skills	To be adequately self reliant, the planner requires a competence in basic mathematics (notably algebra, trigonometry and statistics) and a familiarity with basic financial appraisal processes (particularly Discounted Cashflow methodologies).
Applied skills	These are varied, but extend to such areas as basic surveying and mapping, tree crop description, system costing, work study methods and basic road design.
Knowledge	The planner must be familiar with the characteristics of a range of logging systems, and have an appreciation of logging's operating environment.
Resourcefulness	No harvest planning course can expect to produce graduates who will thereafter be able to dispense instant solutions. Instead it should encourage resourcefulness so that the planner will be able to most efficiently assemble relevant information. Through resourcefulness, the planner's knowledge and skills can continue to evolve.

Teamwork	The harvest planner must be able to efficiently work in conjunction with the other members of the multidisciplinary team involved in forest management. Equally, the harvest planner must work closely with those marketing the forest's output, and the eventual wood users.
Communication skills	A harvest plan is of no use unless it can be effectively communicated to those who must approve it and those who will implement it.
Wisdom	As lofty as it sounds, wise harvest planners are what the industry should aspire to develop. While training in harvest planning cannot ensure this result, it can set useful foundations.

Target Audience for Training

Two broad types of harvest planning training can be distinguished - the *"inception"* training and *"mid-career"* training. With the former, it is assumed that the participants may have had little prior exposure to harvesting. This determines the feasible scope of instruction. Realistically, it also limits the comprehension and retention of what is covered.

Those attending the mid-career courses, such as those run by LIRO, come predominantly, but by no means exclusively, from the ranks of NZCF and forestry degree graduates. Not all of the participants at these courses have necessarily had much exposure to harvesting, but the fact that they are attending indicates a real motivation to develop their familiarity.

Format of the Training

Characteristic components in any course's delivery include:

Classroom - lectures	This has been the necessary forum for discussion in technical subjects.
Field visits	Every commentator on harvest planning - positive or disparaging - exhorts the planner to "walk the block". In harvest planning the field activity may take two forms: - visits to example operations; and - planning exercises in the field.
Classroom - workshops	These provide participants with the opportunity to work at their own pace, with tutorial assistance as required, applying the techniques represented in lectures.
Case study	It has been a feature of virtually all training courses in harvest planning that they include a case study exercise. This serves to give further practice in the concepts delivered and is intended to bring all parts of the course together. Ideally, too, the case study report also provides a useful record for later reference.
Tests and assignments	The extent of formal testing varies with the nature of the course. In the university and polytechnic courses some means of formal testing is obligatory. This has not been the case in the LIRO courses as yet, but is likely to be further examined as integration of such courses with national training structures is considered.

Who Does the Training?

The most visible are the full-time lecturers or course coordinators taking primary responsibility for the various courses. Most of the courses also makes use of guest lecturers, and these may be drawn from the ranks of:

- logging researchers - LIRO personnel are a notable example;
- industry personnel, involved in the actual practice of harvesting

management and planning; and

- specialists in related areas, such as hydrology, environmental legislation, remote sensing, public speaking, etc.

It has been found that the contribution of the industry representatives is especially well received. Their familiarity with their subject, and ability to provide demonstration of the principles in practice, adds most usefully to their credibility.

In the mid-career training courses, significant training contribution comes from fellow course attendees, and an important opportunity for this interchange comes in exercises conducted as groups.

A sizeable amount of training also takes place as self-instruction, and a substantial part of this may be facilitated by computer software. Computer programmes now figure prominently in harvest planning, and therefore, necessarily in training of harvest planning.

It has been my experience that the software can provide a structured learning environment, prompting the student with the necessary questions to further the investigations. In the earlier days of harvest planning software, there was an expressed concern, at times seemingly paranoic, that computer based systems might either subvert the planner's initiatives, or replace them altogether. Such suggestions imply little confidence in the planners' astuteness or sensibility. I believe that the individuals who have a predilection for planning are, on the whole, unlikely to be so naïve as to rely on the first set of output a computer provides.

Numbers to be Trained

These could be determined by some calculations from first principles. Such a process involves analysing the future harvesting levels of the industry, anticipating the structure of future harvesting systems, and assuming a job description for harvest planners. Various factors complicate such a process:

- turnover within the planners' ranks; if they leave the industry or are promoted into higher levels of responsibility, they must be replaced, so increasing the training requirement;

- the extent to which in-house transfer of skills reduces the need for more formal training;

- requirements to meet more rigorous standards of performance.

In estimating training requirements, one can also let the market speak for itself, even though, inevitably, there may be dispute as to whether the market is adequately advised of its opportunities. Thus, for instance, since 1985, LIRA/LIRO has run a harvest planning course every year. This has been supported by the New Zealand industry, involving between 20 and 30 participants each year, so providing something in the order of 275 trainees. Not all have been destined for harvest planning in the New Zealand logging industry. Some, particularly in the earlier courses, attended because they might at some future stage be required to undertake harvest planning. Others recognised that they needed to know better what harvest planners did, and others still came not from New Zealand, but Australia and Fiji.

There have also been three Forest Engineering Institutes run to date (1987, 1988 and 1992), involving 62 participants, of whom 53 were from the New Zealand

forestry sector.

Target Areas for Future Attention

Training in harvest planning currently addresses, in various measure, the subjects shown below:

- Terrain and Crop Information
- Soils and Watershed Management
- Ground-based Logging Systems
- Cable Logging Systems
- Payload Analysis
- Forest Road Layout and Construction
- Log Transport Options
- Costing and Economic Evaluation
- Systems Productivity
- The Human Resource
- Environmental Considerations
- Marketing and Woodflow Management
- Forest Engineering Software
- Harvest Plan Preparation and Presentation

As the planning requirements and available technology continue to evolve, the following can be suggested for special attention:

Terrain Representation

Software packages providing 3-dimensional representations of terrain are becoming available at cheaper prices and with expanded capabilities. This technology can provide a much more tangible portrayal of the terrain than either the traditional topographic maps, or aerial photography. It is my expectation that in the near future it will become mandatory to include perspective plots of the harvesting settings, particularly where the visual characteristics must be considered.

Associated with terrain representation is the Global Positioning System (GPS) technology. This makes feasible the rapid capture of spatial information. Its uses range from confirming boundaries, and capturing roadlines, to tracking machine and truck movements.

Road Design and Construction

The New Zealand forestry sector has not, in the past, used the classifications of "forest engineer" or "logging engineer", to the extent demonstrated by its overseas contemporaries. Instead the classifications have distinguished "Foresters" or "Rangers" from "Engineers". Consistent with the titles, foresters have not been expected to have much expertise in road or bridge structures - instead it has been anticipated that civil engineers would be brought in for the purpose.

This approach has merit - roads are complex structures, and to provide both safety and longevity, they warrant thorough-going design. Engineers will admit, however, that logging roads represent a special case. Although they must carry large, cumbersome loads, often through difficult terrain, their average usage may be quite infrequent. As "low volume roads", they will not withstand a high cost of construction. A considerable compromising of the standards normally regarded as necessary in a fully engineered road may be demonstrated.

There has been a growing call from the New Zealand forest sector for harvest planners to be more proficient in roading. The Forest Engineering degrees now offered at Canterbury University should help fulfill this requirement. This year's NZFEI, too, has an expanded treatment of forest roading.

Estimation of System Productivity

Prior to the demise of the Forest Service, a considerable level of workstudy activity was evident. Thus, the Forest Service had both a North Island and South Island Workstudy Unit, and its corporate contemporaries had their own industrial engineering departments. At this time both the Harvest Planning Group of the FRI and LIRA also produced a raft of

production studies covering a variety of ground-based and cable logging systems.

In more recent times there has been less evidence of such investigation, and certainly less results have been released into the public domain. The potential usefulness of productivity information remains, however, particularly in planning applications.

In the absence of formal industrial engineering initiatives or parallel research activity, it will fall to harvest planners to establish studies supporting their own investigations.

Harvesting Other Species

This subject is very relevant, given the renewed push for short rotation hardwood establishment, which is currently demonstrated in both Southland and the Bay of Plenty. Of course experimentation with appropriate harvesting practices and their refinement is already well underway in both the Kinleith and Caxton eucalypt resources.

The Human Resource

This is a profoundly important component of the harvesting system, yet remains one of the more complex and enigmatic for which to try to predict or improve performance.

While it might be considered that aspects of human performance be more as a matter for management to attend to, planners cannot ignore the human resource.

In particular they need to consider:

- allowing for learning curve effects;
- creating an operating environment which encourages motivation; and
- establishing a workplace and operating system which will be safe.

Safety considerations now assume greater legal implications for the planner under the Health and Safety in Employment Act. Planners clearly have a role in establishing the nature of the workplace, and in the future may come to be increasingly viewed as potentially culpable in the event of accidents.

Wood Freshness

The forest industry has acknowledged the importance of wood freshness for a long time, but this is currently being given some special prominence. The issue requires more than just increased attention to the speed and efficiency of each phase of the operation; it represents an acknowledgement that the most satisfactory place for storing timber is on the stump. The corollaries are:

- the planner must know with real confidence what is indeed standing on the stump - i.e. more confidence in the pre-harvest inventory;
- the planner must have the confidence that the harvesting crews can extract and transport the resource in a short time. This requires good capacity to model and monitor each phase of the extraction and transport operations;

Dynamic Aspects of Plantation Forestry

In comparing planted with natural forests, the most immediately obvious differences relate to the plantations' uniformity - stands in a plantation generally consist of just one species, of a common age. A further aspect of plantations also affects the planning process, and this is their frequent characteristic of fast growth. A stand within the forest may be changing in condition, even

as its harvesting proceeds. This has a bearing on the optimal sequence of harvesting, and matching the resource to markets.

The dynamic characteristics will be even more pronounced with the harvesting of short rotation hardwood crops. Here a block of common age which took a year to harvest could have 15-20% more volume per hectare at the end of the operation than at the beginning.

Planning for Small Scale Planting

At the outset of the recent surge in planting it appeared that the next one million hectares of forests planted in New Zealand might primarily be in smaller, non-industrial holdings. After a little delay the corporates have taken advantage of the apparently benign forest investment environment, and have assumed a significant role in the expansion. There is, nonetheless, the prospect, that an increasing proportion of the future harvest will come from smaller, more fragmented blocks, with a diverse ownership.

Harvest planning challenges associated with such areas will include:

- explaining the harvesting process to those for whom forestry is only a component of their diversified investments;
- dealing with the same group who were once starry-eyed converts to forest establishment, and are now starry-eyed ingénues in harvesting and marketing ;
- handling investors, who for unforseen reasons may want their investment liquidated as soon as possible; and
- if dealing with woodlot forests, handling atypically long access roads, an above average incidence of edge trees, and restrictions associated with other land uses.

Communication

This remains the perennial challenge of the harvest planner. It is particularly a challenge because of the diversity of parties that the planner must communicate with. These include:

- Those whose activities the harvesting must integrate with - i.e. the other members of the forest management team, including those growing the forest and those marketing its output;
- Those who must approve the plan, from within the planner's own organisation, e.g.
  - company management
  - financial controller;
- Those who must approve the plan, from outside the planner's own organisation, e.g.
  - agencies administering the Resource Management Act
  - agencies administering the Health and Safety in Employment Act;
- The concerned public, in all of its manifestations;
- Those who must implement the plan, most notably the logging contractor.

The diverse audience may demonstrate:

- A range of levels of comprehension.
- A range of attention spans.
- A range of receptiveness.

The written format of plans is expected to show ongoing evolution in the face of these requirements. Harvest planning courses have a significant role in suggesting how the plan can be most effectively communicated. It is recognised, too, that for some audiences it is a verbal presentation that will be most important, and harvest planning training is paying increasing attention to this medium.

Conclusion

The New Zealand forestry sector has various courses providing formal training in harvest planning. These supplement the on-the-job instruction opportunities.

Harvest planning is an evolving area, requiring an accompanying evolution in the training courses.