SESSION 4

Paper (f)

NEW TECHNOLOGY IN FOREST HARVEST PLANNING

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Development in Forest Harvest Planning

Over the past decade, many significant advances in the analytical tools for the forest harvest planner have become available. These tools have been developed as small scale computing technology, in the form of pocket calculators and small microcomputers, have become widely available on the market at relatively low cost. Using these harvest planning tools can greatly reduce the burden of time consuming, repetitious calculations which are common to harvest layout and forest road design.

A partial list of harvest planning topics in which new computational aids have become available includes problems in cable logging equipment layout, forest road layout and design, perspective plotting of harvest areas, forest transportation network analysis, land surveying and mapping, and logging equipment production and cost estimation.

One of the first timber harvesting applications developed for small computing installations was a series of programmes written by Carson (1975) for analysing the load carrying capacity of several cable logging configurations common to western North America. These analytical tools were developed on a small desktop computer used in conjunction with a graphics plotter and a digitizing tablet. This combination of computing equipment was also used by Burke (1974) to develop a forest road design package and by Twito (1978) and Nickerson (1977) to develop routines for producing perspective plots of proposed harvest areas. As computer technology has advanced, more sophisticated harvest planning packages which model the entire surface of the harvest area have been developed and are now being used by several large companies in North America. The first of these "digital terrain models" for harvest planning was developed by Lemkow (1977). The U.S. Forest Service is currently working on a harvest planning package which expands and builds on the early work of Lemkow. Fjone (1979) reported that this same combination of a desktop computer, plotter and digitizer has been used by Carson and Skramo to develop a system for cable logging equipment layout directly from aerial photographs. In New Zealand, a similar computing set-up is being used by the Water and Soil Division, Ministry of Works and Development (1979) in an automated national land resource survey system and in the measurement and mapping of river gravel movement and slope mass movement from aerial photographs.

A requirement common to many harvest planning applications is the need to use information from maps or photographs. Traditional manual methods for measuring, recording, and reproducing information from maps are often very time consuming, repetitious and error prone. The amount of time needed to extract and process data from maps and photos can be the limiting factor on the number of alternatives a harvest planner can consider. The analytical tools available on desktop computer systems provide the harvest planner with tools which allow him to more quickly and efficiently extract, process, and display information from maps and aerial photos. By using the desktop computer system, the planner can take a much more indepth look at the planning of a harvest area than could possibly be done in the same time using only manual methods. Use of the desktop system helps the planner to quickly pin-point potential problem areas and concentrate his field time more effectively on these problem areas. Certainly, use of the map-based harvest planning tools does not replace all of the field work in the harvest planning process. On the contrary, use of analytical planning tools requires that field checking of the harvest area be carried out so that factors not apparent on maps and photos are not overlooked. This is particularly important when the accuracy of available maps is suspect. Use of computer assisted harvest planning tools, which utilise map or photo data, allows the planner to much more efficiently use the data available to him on existing maps and photos.

Forest Harvest Tools in New Zealand

Harvesting activities account for a large portion of the cost incurred in the production of a timber crop. This is particularly true in steep country where the magnitude of harvest costs can be greatly influenced by not only the harvest system employed, but also by how well the harvest system is fitted to local topography. Drawing on earlier harvest planning tools developed in North America, a computer assisted package for looking at the suitability of various cable logging systems has been developed by the N.Z. Forest Service. With the package, the feasibility of harvesting an area with a variety of cable logging systems can be tested. The local topography can be examined, either from topographic maps or field surveys, to produce ground profiles. The load or turn size capacity over a ground profile can be rapidly computed for different cable logging equipment and configurations.

After a number of possible harvest alternatives are identified, the computer package contains a routine which allows the planner to rapidly perform an economic comparison of the alternatives to determine which is likely to result in the least overall extraction cost. This economic comparison routine uses production equations which were developed from detailed time studies of harvest systems. The production equations can be quickly modified or replaced to reflect local conditions.

The Logging Engineering Planning Package contains the following routines :

INPUT	A routine to digitize the entire surface of a harvest area to produce a digital terrain model of the area for later use in the skyline analysis programme.
SKYMOD	A routine to analyse the feasibility of cable logging equipment in an area by constructing ground profiles from a digital terrain model produced by INPUT.
ONESKY	A routine to analyse the feasibility of cable logging equipment in an area by constructing ground profiles from either single corridors digitized from topographic maps or from field surveyed ground lines.
PIAHD	A routine to calculate the average hauling distance and area within a harvest unit.
COSTS	A routine to estimate extraction production rates and costs for comparing harvest alternatives for a setting.

All of the routines in the package are written in FORTRAN, a common computer language. The package was developed on a small desktop computer used in conjunction with a digitizer. The package, which is currently in the testing stage, will be put into use in the upcoming year on a trial area. It is expected that many useful modifications and possible expansions to the package will surface during this trial period.

Literature Cited

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