MARKET AND OPERATIONAL PLAN INTERFACE

ABSTRACT
What Stand do we Cut Next?

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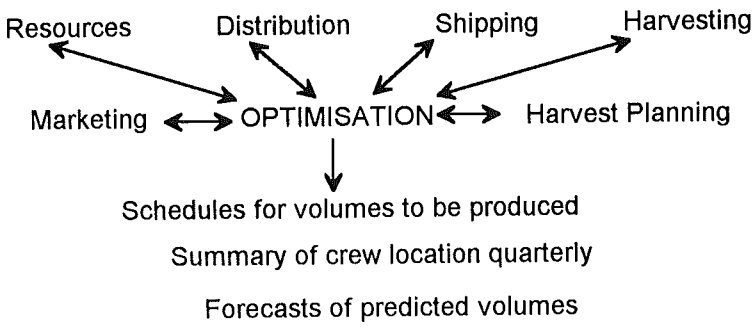
Production planning in today's commercial environment is an extremely dynamic process. Controlling the production from Kaingaroa (NZ's largest commercial forest) requires integrated decision making at all levels of operations from resources and harvest planning to marketing, harvesting and distribution. To follow is a brief summary of how supply is matched to demand and what systems are used in production decision making.

INTRODUCTION

Before outlining the production planning procedure used at Kaingaroa it is necessary to outline the structure from within which the plans are produced.

Approximately 18 months ago Forestry Corporation formed the Corporate Optimisation Group. The group's function was to guide the Corporation to make best use of resources and opportunities available. The concept was developed to try and make decisions based on benefits to the company as a whole rather than individual groups focusing on their cost centre. This concept has been suggested by several researchers, Cossens 1992 suggested "it is pertinent to question whether the quality and value functions should be undertaken by logging departments".



The Optimisation Group performs the production planning function within Forestry Corporation. The scope covered by the group is from the receipt of the Annual Programme from the Resources Group through to the issuing of cutting instructions for Clearfell Quality Controllers to action with logging crews.

Management tasks within Forestry Corporation are performed by the following groups:

Finance	*Accounting, financing decisions*
Forests	*Establishment, tending, logging and roading*
Resources	*Harvest planning, tending planning, environmental policy, forest estate modelling*
Marketing	*Market Allocation, Domestic and export sales, Processing (Waipa & Mt.Maunganui).*
Commercial	*Optimisation (Production Planning), Information Systems, Distribution*

This paper will cover briefly the development of the annual plan through to daily production monitoring. Emphasis has been put on the considerations taken into account and methods used to decide on future crew locations.

SEVEN YEAR PLAN

The Resources Group run simulations using the FOLPI model to provide a seven year plan according to several constraints i.e. non declining yield and cashflow, catchment constraints, operational constraints e.g. area suitable for processing plant, haulers and various volume constraints.

The linear programme maximises discounted cashflows based on the projected yield over a seven year period. Yields are predicted using MARVL inventory data and growth model projections.

Using the best information available the FOLPI simulation selects a group of stands which go into making up the provisional Annual Programme. This Programme is checked in detail to make sure it fits within all operational constraints. Areas carried over from the current logging programme are considered when making up the following year's Programme.

This annual plan is then forwarded to Optimisation, Harvest Planning, Harvesting and Marketing. Resources also monitor the volume outturns from the current programme.

ANNUAL PLAN

The Logging Manager in conjunction with the Harvesting Planning Superintendent designates logging systems to Harvest blocks according to several criteria. The logging system and eventual logging crew for each block are assigned according to block constraints:

- Topography
- Soils / Climate
- Rainfall
- Distribution / Roading Access
- Environmental Constraints
- Health and Safety Constraints

and also crop constraints:

- Species
- Piece Size
- Stocking Rate
- Branch Size

Once it is determined what type of logging system is required Harvest Planning will do the detailed plan of the block. More difficult blocks are usually planned first to

avoid time constraints. The aim is to have most of the next year's Programme planned before the year commences.

The roading and roadlining Annual Programme is passed onto the roading Superintendent and roading Supervisor to schedule access, construction and road maintenance. The initial stands that will be required from the Programme are indicated. The criteria for selecting these blocks is covered later.

Often roading and roadlining will only be performed one month before the intended harvest date. In extreme situations this may be even less. The Harvesting Manager and the Optimisation Group produce an annual plan which forecasts the order these stands may be harvested in based on:

- Current location of crews and forecast completion date
- Expected progress through stands based on estimated production
- Appropriate logging system for each block

This is the beginning of an interactive process which continues throughout the year. The forecast grade outturn from these stands is forwarded to Marketing for their feedback. Changes are made depending on market forecasts. This pencil plan forms the framework for the Quarterly Plan.

QUARTERLY PLAN

Marketing enter planned orders on the Order Entry system up to a maximum of three months in advance. Information from these planned orders is matched to predicted outturns for the current crew locations and predicted future locations.

Changes for future crew locations are entered on a Gantt chart to display the locations of crews. The outturns from these crews are calculated on a spreadsheet. The criteria for which stands are planned next are primarily driven by demand within production constraints. As stands have already been matched to production

systems and provisionally assigned to crews the amount of options for each crew is limited. Production constraints to be considered for crews next location:

- Preparation level (roading and square formation)
- Resource constraints (especially in sensitive areas)
- Seasonal suitability

If total log supply forecast exceeds demand in all grades then future crew movements can be planned to put crews in smaller piece size and roadlining operations. A more common problem is for the supply to be out of balance with demand. The totals may match but not for each grade mix.

This plan has to regularly be updated with the changes in demand. At Forestry Corporation we have a changing export customer base leading to large fluctuations in demand. These fluctuations in demand are firstly solved by changes to cutting plans (crews cutting instructions) but more commonly by changing crew location to better match resource to the demand by grade/length.

Due to the physical environment which exists within Kaingaroa making operation changes at short notice is possible. Although not desirable crews can be moved into new blocks and roadlining performed over a short time period. The pumice soils and relatively flat terrain make this possible. From a planner's point of view this can cause many headaches and is not necessarily an advantage. From a company and especially Marketing viewpoint this reaction ability is a major advantage and gives them more flexibility in the marketplace.

MONTHLY PLAN

Planned export orders are approved as negotiations are completed. These orders are entered in a spreadsheet and compared to stocks. Domestic sales have a monthly forecast which is entered, these sales are approved on a weekly basis.

From the orders and stocks the required production is determined. Imminent crew moves are planned at the monthly level according to criteria described the Quarterly Plan.

Weekly Targets for the coming month are provided to Harvesting at the weekly Production Planning meeting. At this meeting plans of action are decided regarding options for increasing/decreasing production.

A production plan of how orders are to be filled is completed by the Production Planner. This production plan calls upon rules of thumb and experience. "*Log production control is more of an art than an exacting factory science*" Gleason and Bailey (1992). The specifics of the order are taken into consideration and most suitable cuts are planned for the Central Processing Plant.

WEEKLY PLAN

Domestic orders are entered onto the Order Entry system for the following week after a consultation with Production Planning as to whether they will be possible. A plan for export orders for the week is derived from the monthly plan. From these orders cutplans for each logging crew and the Central Processing Plant are produced. Cutplans are determined for each crew using several criteria:

- Large export orders that are imminent
- Difficult to obtain products
- Domestic orders required next week
- Future orders that are approved in the Order Entry system.

If all orders planned for the next week cannot be scheduled there are several forms of action that can or must be taken:

* Reduction in total production;

- Saturday work or short weeks
- Move to blocks with bigger/smaller piece size
- Move crews to alternative species
- More/less roadlining (lower production).

* Change of balance of orders;
  - Crew location within compartment/forest
  - Suboptimal cuts i.e. overspecing
  - Change mixture of input stems to Central Processing Plant
  - Change order.

Marketing are informed of problems with surpluses/deficits of orders and will attempt to delay or obtain more orders. Information regarding anticipated production problems need to be conveyed to Marketing early. There is only limited opportunities for selling more logs on the domestic market so the export market will be requested to change its order structure. There is however, a delay in obtaining vessel space for export orders so planning must be done in advance.

DAILY PLANNING

The Production Planner monitors daily order delivery information from the Transport system. Log stocks are recorded by logging crews daily and returned for entry into the Stocks system each night. Using this information the Production Planner can make changes to gangs cutting patterns as orders are filled. These changes are given to supervisors who pass on both verbal instructions and a hard copy.

A relatively new area of Production Planning within the Corporation is the scheduling of the Central Processing Plant. Higher emphasis can be given to stem input from compartments with the desired wood characteristics of the time and thus helping to satisfy urgent orders.

Distribution plan daily deliveries according to the orders placed or the Transport system. Trucks are sent to crews showing stocks of the ordered product. These stocks are reduced by an approximated load amount (28 tonne for sawlogs) automatically. The destination for this product is also entered. From this information it is possible to determine each morning how much of the deliveries are outstanding and how much product is in stock.

How much stock to hold of any particular grade and length depends heavily on information from Marketing. The current aim is to only produce orders which are approved and contracted to the customer. This cannot always be achieved due to imbalances in the order files. Pressure is put back on Marketing to sell the predicted surplus if balance cannot be corrected using crew movements.

FUTURE TRENDS IN PRODUCTION PLANNING

Flexibility

There is an increasing need for today's forest planners to maintain flexibility. Reasons for requiring flexibility:

- React to changes in market place, by far most important
- Maintain balance in orderfile
- Keep contractors employed year round
- Processing plant output able to be changed quickly as long as input can change.

The Future

From Forestry Corporation's experience targeting end users has initially made us more susceptible to fluctuations in demand than trading houses. We have also been exposed to a shorter planning horizon for orders. Changing stands at short

notice is becoming more common. Also we have a continuing trend to more product differentiation. Most value is obtained from each stem by cutting to maximum grade availability. This is leading to more complex information requirements. The development of information management systems combining orders and current stocks and adding predicted production from given locations and targets is critical to be able to make accurate informed decisions. In today's dynamic environment planning decisions can only be made with all the information at hand.

Whyte (1992) advised that researchers should work towards " *providing a modelling capability which takes cognisance of whole systems, which can be broken down into manageable parts, which provides interactive and iterative means of obtaining coherent solutions that are as little subject to precluding assumptions as possible, which has formal auditing and calibrating routines built into it and which takes advantage of computer software and hardware regularly used by management.*"

The importance of obtaining quality customised reports which minimise information down to the essentials for each individual user can not be emphasised enough.

In an address to the 1992 IUFRO conference Gleason, A and Bailey, C suggested "*we cannot afford the time to run sophisticated optimising models on day to day operations*".

This is true of the currently available all encompassing LP type models. Tools which can assist the production planner in making quality informed decisions are becoming a must due to increasing complexity in today's commercial environment.

SUMMARY

The most difficult tasks from the Production Planner's point of view is not making the best decision where to move a crew to, but obtaining the information necessary to make that decision. Simple information like current orders, stocks, their current location and planned production over time are difficult to combine in large forestry companies. The current number of unique products (i.e. grade/length combinations) from Radiata alone is approximately 200 and these have to be matched to a large

number of customers each with individual transportation and treatment requirements.

The development of a robust Stock and Order Management system and subsequent implementation of such a system is of far more benefit to today's forest manager than a complex LP based "Where Should We Be" model. Before we can model the optimal solution for log production we have to first find out where we are now and where we and predicted to end up given the current:

- Stocks
- Production Estimates
- Demands
- Conditions

This information needs to up to date and readily accessible using familiar tools.

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