

# Technology before the mill gate – manage with data

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## Abstract

This paper gives a personal account of how New Zealand and Australian forestry companies have treated technology over the past 4 years that I have been working in the industry. The principle 'you can't manage what you can't measure' has been very evident and shining examples appear constantly. However I am dismayed at the lack of interest in this principle and the effect ignoring its importance has on our industry.

## Introduction

From the outset of this paper I would like to make it clear that I am a relative yearling in the forestry industry and my enthusiasm comes from hope in our industry's future, the inherent benefits that it brings to the world, and the diverse range of opportunities it offers to those who are engaged in its many components. However I must say that corporate accountants and management consultants should take the bulk of the blame for my dampened spirits over this past year, rather than the US dollar, as I get the feeling I am not in control of my own destiny within this industry as long as they are around.

When I graduated in 2000 there was a wall of opportunity (wood) to surf, I had gained a fascinating total of 8 months logging experience (without putting a nick in my boots), all around me new technologies and data capture were rife, and best of all – pruned logs were selling at \$160/m<sup>3</sup>. Within 2 weeks in my first forestry job I was sent to Brazil for a month long inventory project (during Carnival too), and by the end of the year found myself working for 2 weeks in Idaho knee deep in snow. The industry was great.

By 2004 I have seen 18 of my fellow forestry graduates leave New Zealand citing diminishing opportunities for career development; the CNI forest owners slashing harvest volumes, contracts and valuable experience; and non-essential innovators and technology thrown into the street whether relevant or not.

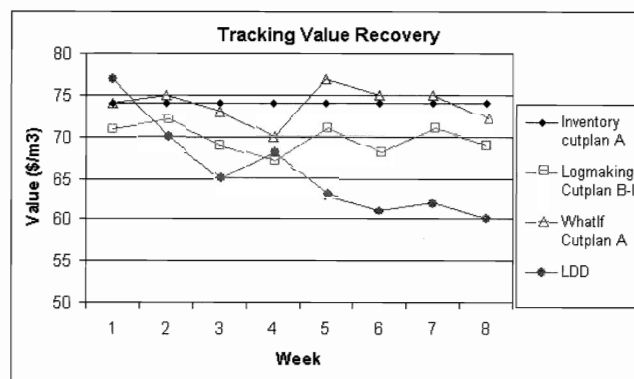
Given my relatively short experience I will attempt to describe some management tools I find essential, some exciting yet fragile new developments, and why I consider those who do not manage with data to be bordering on incompetent.

## My most valuable lesson

I consider myself privileged to have been employed by an innovative company that, over a period of 3 years, grew what I saw as a system that provided the best management feedback loop available to New Zealand forestry. As a company we set about demonstrating that, if given a chance, we could show any forest management team where they were losing value and who was to blame. Of course this loop came at a cost of \$1/m<sup>3</sup>, but the savings to the forest owner could be four times the cost and growing.

The secret was to watch a graph, not too dissimilar to the one in Fig. 1, develop on a weekly basis. A thorough inventory assessment that had PLE% targets was completed in conjunction with a close analysis of stand area. The data was analysed against a valuation cutting strategy (Cutplan A) and this value and volume (given error limits) became the target to achieve.

*Fig. 1: IFR Logger system allowed us to track value recovery. The What-If cutplan shows the potential value of the resource. The value of the Log-making cutplan (what was cut) is lower because of sub-optimal marketing. The value of what was actually paid for (LDD) is lower again because of the loss from quality control, mis-fleeting, and cutbacks etc.*



A key to the success of the projects was that every stem felled in the stand was optimised using the IFR Logger system. This allowed us to capture an electronic description of each stem and optimise the bucking of it against the cutplan of the day (Cutplan B-I). Despite the hype, optimisation is not the true selling point of the system. It was the data flow. We proved time and again that the value increase through

optimisation was real in the hands of a willing logmaker, but the power of the system was in the data at our fingertips.

The data was downloaded through the telephone to our database daily and we could then simulate re-cutting each stem using the initial valuation cutplan (or any other cutplan for that matter). The difference between the Inventory cutplan A and the WhatIf cutplan A in Fig. 1 indicates the battle between the inventory crew and the logmaker in describing the resource. Whereas the Inventory cutplan is based on what the inventory crew saw for the whole stand, the WhatIf cutplan is what the logmaker actually finds.

The Logmaking cutplan B-I is what is actually cut. The gap between the Logmaking cutplan and the WhatIf cutplan is the fault of the marketing team. It arises because some grades in cutplan A weren't in cutplan B-I because there is no sale for them.

The LDD (Load Delivery Docket) is what leaves the forest - what you get paid for after the logs are scaled at port or they have been over the weighbridge. The gap between the LDD and the Logmaking cutplan B-I is the loss from quality control, mis-fleeting, and cutbacks etc.

We began paying bonuses for closing gaps, and anyone could nark on anyone else for making gaps more difficult to close (e.g. more rejects meant the logmaker was over-valuing their stem description). The team effort was rewarded too. We knew exactly where to focus attention in our value chain.

I've heard all the excuses under the sun as to why a crew shouldn't use the data capture tool, but I've never seen it make a skilled logmaker become the bottleneck in an operation, and only incompetent logmakers entered garbage data (garbage in, garbage out).

I'm going to offend some people here when I say that the only way I can sum up why more companies aren't using it today, or chasing a similar system, is they weren't clever enough to make it work for them. They wanted everything handed to them on a plate and were either too lazy, too big, or too busy fighting fires. I taught myself how to use it, bugs and all, in a matter of days (and watched five others do the same). Over the years I have seen it do everything it promised to do. Hand on heart. So why aren't we using it full swing today? Well, to cut a long story short, some clever corporate high flyers had come to the realisation that they had over cut their forests to pay for poorly managed debt. And if you've been around for the last year you'll know the end of that story.

I can't see how a management team can't make this powerful data work for them, and today I

wouldn't work for a company that wasn't willing to measure performance at this kind of level. It would feel substandard, unprofessional and against what I consider to be my duty as a professional forester.

## Fragile new developments

### *Inventory*

This one's a goodie. I predicted it would be here about now a year and a half ago, and even downloaded some medical software (for counting cells) from the web to try and do it myself. What is it? Complete enumeration (of trees) via satellite imagery or standard aerial photography. Falcon Informatics boasts a software package that can accurately count all of the trees over hundreds of hectares in a few minutes, to within 98% of actual (except for extremes in stocking etc). Interpine Forestry is currently in the USA validating the software and science through ground cruises, and all I can say is watch this space... no pun intended.

The reason I think the Falcon system will work comes purely from watching it work on sample photos that we provided of stands we had harvested. Realistically the knowledge on this kind of process is extremely proprietary and only the broad concepts are explained. Systems to date (including the one I tried to make) need a lot of calibration, even to the point that it would be better to just count the trees in the photo by eye in the time it takes. Current systems also often try to draw little rings round each tree and to do this the conditions under which the photo was taken need to be very good.

Within the Falcon system a photo is converted into pixels and the system goes about blending the pixels into blobs. A blob has a light point (tree tip) and dark edges (lower branches). Dominant and co-dominant trees make great blobs, and suppressed trees don't register as blobs at all. Forked trees still register as 2 blobs in this software (so maybe not so good for very ugly forests). The big secret however is how the software deals with the angle of the sun and the difference between trees in a gully and a ridge at the same time. We'll probably never know how it does it. I'm told that the software is ex-military and it was 'stumbled across' as a forestry application. It was used for finding the heat signals of human bodies under forest. They couldn't count the bodies because the program kept counting the damn trees instead.

As a resource forester I grapple with area inconsistencies daily, and know all too well the effect of this multiplicative error that we apply to our inventory data. However with complete enumeration there are huge efficiencies. The population is the trees and not the surrogate -

area. Farmers don't estimate the number of cows they have based on a sampled area of their paddocks. They count them all, and very soon the technology will be ready so we foresters can too.

The temporal and financial efficiencies from complete enumeration, and the attention paid to individual trees will allow us the budget to start using technology such as Fibre-Gen's Tree Tools to sample internal characteristics too. In the very near future an inventory crew will be a one man band carrying \$10 000 worth of field computer and technology on a randomised bush walk admiring individual trees. Sound like fun – it will be.

An addition to the move to individual stem based inventory comes from my growing involvement across the Tasman. It has become painfully obvious to myself and our more astute Australian customers that they throw away perfectly good inventory data on a daily basis. This is because the average final production thinning operation is done by a computerised, stem optimising, harvester (Fig. 2). The machine collects a full stem profile of every stem it processes and currently no one collects this data. Instead the data is wiped on a daily basis as the computer requires more space for more stems. In conjunction with complete enumeration the thinning harvesters will be the Aussie future inventory crew. I dare say that once New Zealand forestry returns to production thinning (with energy requirements of the future in mind), we too will consider this method on our flatter lands.

*Fig. 2: Wheeled harvester: The Australian inventory crew of the future.*



### **Buckmaker**

Awdon Technologies has recently completed its Buckmaker project and is now, thanks to the progressive folks at Pan Pac, being production

*Fig. 3: Buckmaker: under production testing as an approach to optimise log-making*



tested. The Buckmaker (Fig. 3) is a different approach to collecting the same data that the IFR Logger did. Each stem is scanned on a rigid bench using lasers (sweep and diameter) and some descriptions added by the operator. The stem description is optimised for log placement and the solution wirelessly passed to the Buckmaker processing head. The head cuts the solution and fleets as it cuts. All stem descriptions and stocks are downloaded into a web accessible database every 10 minutes allowing constant access to stocks and cutting strategy simulation. It is distressing to think that our industry was so preoccupied with ownership that the Buckmaker was almost scrapped before being adequately field tested as no one had wood for it to work on.

### **Aussie harvesting**

Recently Australian forestry companies have been coming to grips with a golden opportunity that has been sitting under their noses for years. Harvesters such as the one in Fig. 2 have a predictive optimiser installed, and have done since the 80s, however those optimisers have been switched off until now. One only has to visit the websites of Timberjack, Valmet, Log Max and the likes to see how things have progressed. Automated cutplan transfer, output downloaded to central database every 10 minutes, live stock control, GPS tagging of stocks etc. One company has started utilising this power. Their value recovery was 60 – 85%, and now sits around 96%. At 1500 tonne per day this equates to a \$2800 daily increase per crew for the forest owner. Much of the gain comes from better resource allocation (at the log level) while cutting at pace. Now other companies want in on the action.