TANGOIO FOREST ROADING & TRUCKING

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Tangoio Forest comprises a number of farm units, which presently make up a major block of 2,500 hectares plus several outlying blocks totalling some 4,000 hectares.

Situated 20 kilometres North or Napier the forest areas are 0-30 kilometres distant from the Whirinaki Pulp Mill via State Highway, County roads, and forest roads.

Planting of the forest areas commenced 1970, with the main block being completed 1975. It is worthy of note that all plantings of these forest areas was undertaken by myself or under my supervision, so it could be fairly assumed I have an intimate knowledge of the terrain, climate, and geology of the area.

Apart from some 500 hectares of rolling frontal country, land which could be described as difficult skidder or relatively easy tractor terrain, the remainder of the area is fraught with terrain and soil induced difficulties. Ridges are relatively uniform and regular, however these are separated by 50-60% deep valleys of convex slope. Being of limestone and sandstone parent rock, outcrops of the strata occurs at fixed altitudes. These outcrops therefore appear anywhere from upper valley side to lower valley, generally vertical, or appearing as large single rocks or "floaters". Over this limestone is a wide ranging clay soil, frequently holding water where the base rock is impermeable. The topsoil is an extremely fertile heavy block loam which holds water in winter to produce a very slippery surface. Naturally the valley sides have been subjected to severe sheet erosion since the earthquake of 1931, and as result of a number of 99 year floods since that time. So that land presents a picture of extremes of terrain and soils, and a known history of floods and droughts.

From the first planting days it was assumed the entire area would be clearfelled by hauler, with some people having doubts about that. I never believed the job to extract the wood, would ever be mine. Access for planting was via very crude farm tracks which snaked up ridge toes and around limestone outcrops to reach the reasonably navigable ridgetops, which were generally untracked. These tracks were barely suitable for wheel tractors, the mode of transport for planting operations. Further "roading" for sivilculture comprised widening these tracks to make them safe for dry weather only, access by four wheel drive vehicles. In essence the forest were un-roaded.

PRODUCTION THINNING:-

The decision to production thin was taken in 1983, promoted by myself, and ultimately accepted by Pan Pac in recognition of the potential contribution the wood volume could make in the total requirement scene. At that time most stands had received a light waste thin to remove gross malforms, and in some areas a low prune. Some other stands had received no treatment at all, and perhaps had not been visited since planting.

ROAD PLANNING:-

To use the existing very low standard County road, with two bridges of very dubious capacity (one at right angles to the carriageway) was the first area of concern. Initial discussion with the County indicated the 4 kilometre road may cost us $400,000 to upgrade and possibly seal to avoid dust contamination of the adjacent vineyards (grapes). Provision had been made at time of land purchase to link all the forest properties to enable off-highway cartage at clearfelling time, direct to the Pan Pac site. Following discussion with Pan Pac personnel the decision was taken to establish an off-highway route (6.7 km) rather than use the County road and State Highway. The required standard of road was vigorously debated, resulting in final agreement that the "forestry" standard would prevail, in this case the minimum of carriageway width and basic alignment and gradient objectives. The final act of planning comprised an abney check of grades to achieve a road of minimum adverse grade without major earthworks and forest destruction. Construction of the road was very rapid, resulting in completion some few months after commencement. Naturally some of the curves and gradients required further upgrading, a result of experience following use of particular trucks.

With the completion of the arterial route, the on-going planning and construction of further arterial and spur roads became a major field exercise. My prior knowledge of the land in its bare state was of major benefit to me. It was clear where roads could, and must go. It was also clear where they could not be contemplated.

Conflict did, and always will exist in the decision as to how much forest should be cleared to provide roadlines and landings. With the decision being mine, it is only where my directions are not followed that I can be critical. The logger always seeks to clear more trees rather than less, to provide landings etc., so mutual supervision is demanded - the logging supervisor and the forest manager. At all times the costs of formation and metalling must be weighed against the volume of wood required to be carried over the road. This is no easy task in steep country that you are not entirely sure whether or not areas can or cannot be thinned. Standards of metalling are of major cost impact, however the objective to save metal and have dry weather access only, can have the reverse effect if weather is not kind.

At all times the decision regarding road location and standard was taken bearing in mind the likely use of the road for future clearfelling. Bearing in mind our original belief was that most of the area would be cable logged, to tractor thin and therefore plan tractor clearfell is a major change of heart.

VALLEY ROADING:-

Within the 500 hectares of easier terrain valley bottom roading was established whenever possible. While costs of formation and metal consolidation was always higher, a result of the presence of deep black soils, often water-logged, considerable savings in downhill extraction off-set higher road costs. Savings of $5 per tonne logging cost were frequently possible by reducing drag length by the construct-

ion 100-200 metres of road - a cost of $1,000-$2,000. Because of the certainty of future use for clearfelling of valley bottom roads, a higher intensity of roading was justifiable - up to 28 metres per hectare.

RIDGE ROADING:-

Frequently no options exist in the steepland. Roads are located where they can be constructed, with and spur roading being on the maximum grade a truck can handle. Ideals have no relevance. As the objective is to thin the maximum area possible until negative royalties result, an estimate of roading and logging cost must be done for each spur or feeder road. This calls for an estimation of wood served by the road, the most difficult aspect of the job.

STANDARDS & DESIGNS:-

Roading specifications are now set at all-weather standards, 7m. formation width, 5m. carriageway width, capable of carrying 55 tonne gross weights. Arterial and secondary roads are little different in specifications, apart from the incidence of passing bays. Old landings are frequently converted to passing bays. Metal depth and strength has to be consistent on the clay soils. Base coarse is about 30-50 c.m. compacted depth with a 30mm. running coarse surface.

FORMATION:-

One attempts to use the right machine for the job. Ridge roading calls for mainly scraper cut and fill, which enables limestone to be carried from any exposed seam, to be applied as base coarse. Scraper hire always appears expensive, but is generally cheaper in the longrun as result of full use being made of all soil, and achievement of compaction.

FACE CUTS:-

Large excavations have been found to have great value in conjunction with a dozer. Being capable of minimum soild disturbance, productive area of forest is less affected. Less soil is required to be shifted to achieve formation width. A dozer may shift 3 times the soild volume to achieve the same result.

METALLING:-

Formation grading, followed by a compaction roller produces the required formation standard and makes full use of natural stone in the formation. Limestone is then applied to a depth of 30-50cm. (depending on composition). This limestone is ripped from seams within the forest, passed through a 25cm. screen, to produce material from sand to football size. A vibrating roller is used to compact the limestone and sand, afterwhich the running coarse of crushed river metal M5 is applied. This material is very thinly applied to seal the surface, provided better wearing ability, and excellent traction. No suplus exists for the maintenance grader driver to deposit in the water table.

We have come to appreciate the immense value of the limestone to the economics of roading in Hawke's Bay. Without this type of material close at hand the entire thinning programme may not have been economic.

GRADES:-

Where volumes do not support high cost roading, grades 1:6 adverse, and 1:5 with load have been satisfactorily employed.

While grades of 1:10 for arterial roads are desirable, 1:8 are used where excessive loss of forest area would result from achieving the 1:10 minimum.

CORNERS:-

It has taken some time to fully appreciate the need for careful design of bends. A level even surface is the most desirable, capable of being negotiated by a unit of 55 tonnes, 16 metres in length. The slightest super-elevation on maximum curvature of adverse grade can produce a 55 tonne problem of some magnitude. Reverse camber is frequently employed in particular grade circumstances.

TRUCKING:-

The decision to use self loading trucks has been one of our better decisions. Better weight distribution over the drivers would have improved performance, however in the off-highway situation a purpose built machine would be necessary to satisfy my every wish. The use of trucking in difficult conditions such as Tangoio Forest demands new gear. Heavy loads on steep grades, sorts out any weaknesses in truck design or construction.

GENERAL OVERVIEW:-

From our experience to date, the standard of road selected has been adequate. Some alignment improvements will be necessary prior to major clearfelling use, but otherwise little upgrading will be called for,

It should be noted that the production thinning stumpage revenue has more than covered the entire costs of roading. Remember, little or no roading existed prior to commencement of thinning. In general terms the forest is 80% roaded for clearfelling at no cost.

The use of self loading trucks has reduced the normal area loss incurred in landing size, and extraction tracking by 2-3%, compared to conventional trucking with rubber tyre loader.

We may have halved our initial, and maintenance metalling cost by use of the vibrating roller, which ensures every stone stays on the formation, and remains tightly in place.

I have been most fortunate to have had the opportunity to experience management of a forest from planting to harvest. From this experience I can measure effects of my mistakes, and benefits from the good decisions. Learning from ones own, and others mistakes, is very important in road design. We have all seen an excellent grade achievement ruined by a poorly designed corner either end of that grade. All road planners should be made to stick around and face the consequences of poor design, or perhaps more common, be required to justify the high cost of roading that he committed his employer to.