ASSESSING IRRIGATION WATER NEEDS FOR WATER AUGMENTATION IN THE MOTUPIKO VALLEY

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This presentation describes the hydrological components of a water augmentation pre-feasibility study carried out by Landcare Research and Tonkin & Taylor for the 347 km^2 Motupiko catchment near Kohatu in the upper Motueka Valley (Fenemor et al 2007).

The water source for irrigation is principally the Motupiko River and the groundwater in the shallow alluvial gravel underlying the river flats. Growth in irrigated agriculture and horticulture in the Motupiko catchment has stopped, as the allocation limit for river and aquifer combined of 110 l/s has been met already through the 13 current water permits for an irrigated area of about 191 ha.

The aim of the water augmentation study was to scope irrigation water needs and storage options to meet potential demand from up to 216 landowners over the next 20-30 years. The agreed concept was release of water from a storage dam(s) with water to be pumped from the river or aquifer downstream, similar to the recently completed Kainui dam in the Wai-iti Valley (Fenemor et al., 2003).

The project comprised:
Irrigable land use assessment, water availability and water needs analysis.
Selection and short-listing of storage sites.
Description of effects of water augmentation.
Cost estimation for short-listed sites.
Landowner discussion and formal community consultation..

The total irrigable land was calculated at 3228 hectares with 2024 hectares being on slopes less than 5 degrees. The lower Motupiko has great potential for a range of irrigated crops such as berries and vegetable crops, but landowners consider the most immediate opportunity for irrigation would be for pasture irrigation for dairy development.

The study short-listed five medium sized storages (1-3 million cubic metres). Determining what size of dam was required was an iterative process using a series of linked models for different stages. The 3 stages were:

1. Model irrigation demand, using an irrigation scheduling model based on rainfall data since 1954, for irrigable land areas likely to be serviceable from that storage dam.
2. Model the amount of water flowing into that storage dam, using the catchment land cover water balance model WATYIELD (Fahey et al 2004). Forestry scenarios were simulated in WATYIELD by replacing pasture with forest and any recently cut forestry with mature canopy.
3. Simulate a time series of reservoir storage volumes based on preliminary site topography measurements and the release required to meet the irrigation demand from step 1 in 9 years out of 10.

Irrigation water demand calculated in step 1 was checked against recorded water extraction for 33 hectares of irrigated pasture in the Wangapeka for summer of 2005-06. Figure 1 shows the observed vs predicted extractions. Although the scatter is large the total volumes extracted over a 16 week period agree within 8%.

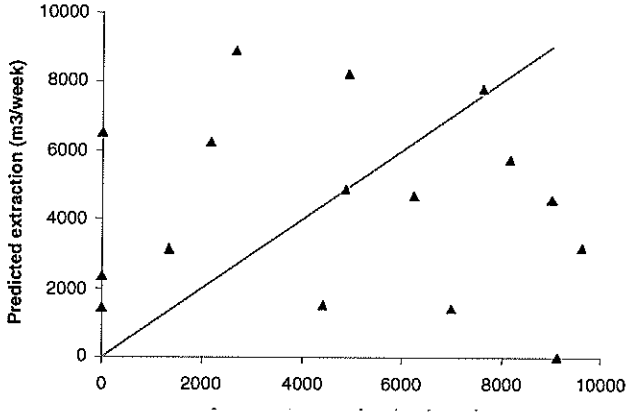

Figure 1: Observed vs predicted irrigation extraction for a farm at Wangapeka. Line is 1:1.

Reservoir storage was modelled based on measurements of the valley dimensions. This allowed relationships to be drawn up between dam height and storage volume. The daily storage in the reservoir (e.g. Figure 2) was calculated based upon:

Modelled catchment inflow;
Reservoir evaporation, modelled from potential evaporation data;
Spillage from the reservoir when it filled to the dam height;
Release of water from the reservoir to meet that portion of the irrigation demand not able to be met by natural flows in the Motupiko river, without it drying up in its lower reaches as it does at present;
Release of water to meet a residual flow requirement below the storage;
Release of an additional 10% of irrigation demand to allow for non-recoverable flow losses to groundwater.

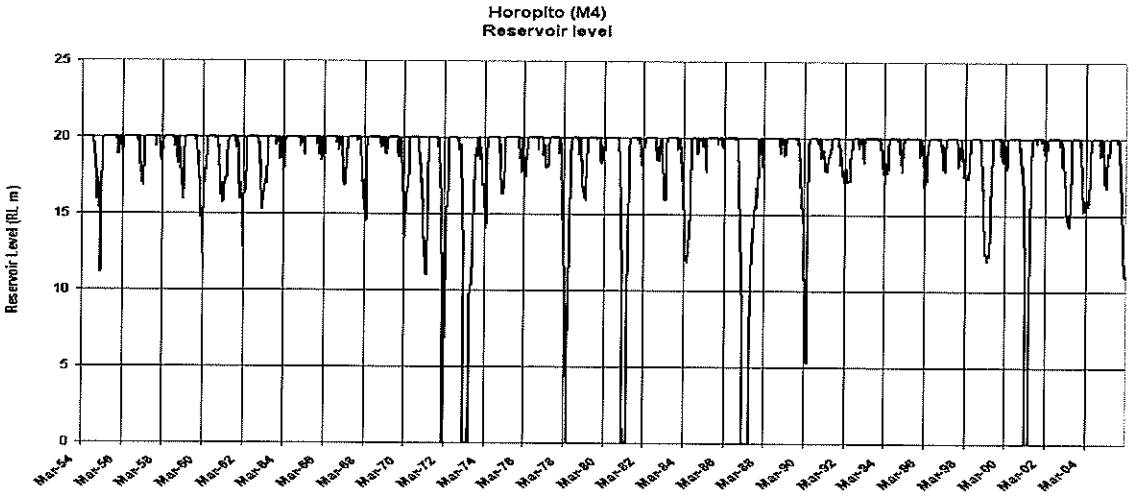

Figure 2: Simulated reservoir level for a 20m high dam on the Horopito irrigating 750ha of grass.

Reviewing the dam heights and potential storage volumes showed which of the dams would be most cost effective. Two were short-listed and costed in more detail by Tonkin & Taylor. For a nominal 1000 ha irrigated, the per hectare capital cost estimates were $4800-5200, or 12-21% higher than actual costs for new users in the Wai-iti scheme.

Acknowledgements

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