Journal of Hydrology (NZ) 34(2): 63-71, 1995

GUEST EDITORIAL

Current New Zealand Irrigation Policies: How Relevant Are They?

David Dravid[1], Jim Watt[2], Keith Vincent[2], and Ruth Beanland[3].

[1] *Resource Scientist, Hawke's Bay Regional Council, Private Bag 6006, Napier.*

[2] *Scientist, Manaaki Whenua Landcare Research New Zealand Ltd, Private Bag 1403, Havelock North, Hawkes Bay.*

[3] *Lecturer, Department of Planning, Massey University, Palmerston North.*

Introduction

Over the last decade supplemental irrigation has become increasingly important to New Zealand agriculture and horticulture. Total water consumption is estimated to be 2000 million m^3 per annum, and irrigation now accounts for just over half this at 1100 million m^3 per annum (Waugh, 1992; Department of Statistics, 1992). While surface waters are important, groundwater is being increasingly used and is now the source of over 50% of the agricultural and horticultural water used for irrigation, stock and farm water supplies. This increasing total use and greater reliance on groundwater supplies raises the question as to whether the allocation policies and "water rights" of previous years are appropriate in the 1990's.

Contemporary resource management is increasingly concerned with "sustainability" and environment protection. Resource consents issued under the Resource Management Act are intended to acknowledge these concerns. Older "water rights" granted legal authorisation to use water, and provided the Water Authority with a database of *who* was using water and *where*. A modern "consent to take water for the purpose of irrigation" should now be addressing much wider issues. For example, 'how appropriate is a "water right" for a particular combination of crop and soil?' 'To what extent is protection of local aquifers and surface water from excess irrigation a concern?' Irrigation should now be acknowledged as a practice that not only supplies water to the root zone of a crop, but which also involves movement of water beyond that zone, with the possible consequences of leaching of nutrients and

translocation of agri\chemicals. It is thus appropriate to review current policies to see whether they reflect such considerations.

Current Irrigation Water Allocation Policies

Sixteen Regional Councils and Unitary Authorities were surveyed throughout New Zealand to ascertain the nature of current irrigation allocation policies (Table 1).

Analysis shows that:

- Nine have no definite policy.
- Four have policies based on crop type.
- Four have policies that define a maximum limit on the quantity of irrigation water allocated.
- One has a policy based on aquifer type.
- Those Councils which do have policies base the irrigation allocation on assumed demands based on crop type and atmospheric conditions (i.e. potential evaporation).

This survey identifies some interesting issues...

Firstly, it is apparent that there is *no consistent policy in the allocation of irrigation water* in New Zealand. The need for supplemental irrigation varies in different parts of the country, and Councils have acted to meet their particular circumstances in their own way. In some areas it would seem that any person who has asked for a right has received one. The specification of the right has been generous, loosely defined, and rarely checked except where water is metered. Occasionally, personal experience has shown a right to be simply what a pump delivers! In essence, as observed by Beanland et al. (1994), water has been allocated on a "first come first served" basis. This in itself need not be criticised, but it begs the question of what constitutes a good policy that is both robust and applicable to the 90's.

Secondly, it is apparent that the *fundamental basis* for most "rights" has been the *perceived water-need of a crop*. Underlying most specifications is an assumed 3-5 mm/day of water use, which, when multiplied up by the area of application, determines the volume required. As a general arithmetic basis this is reasonable, but simplistic. The contrast in water need and water scheduling between, for example, good pip-fruit irrigation and good potato irrigation is not considered.

Thirdly, there is *no recognition of the role of land and soil* in accepting water. In areas with high water tables upward movement of water can affect the root-zone water balance. Every area, and indeed every paddock, has its own soil hydraulic character. The "appropriateness" of a water right (or "consent to take water for irrigation") to the specific area of application is often not considered.

TABLE 1 — Survey of irrigation-related water allocation policies in New Zealand

Territorial / Unitary Authorities	Land in Horticulture as at June 1992 (ha) *	Approximate Number of Irrigation Related Consents	Summary of Irrigation Water Allocation Policies	Remarks
NORTH ISLAND:-				
Auckland Regional Council	12505	1700	i. 25m³/day/ha for orchard crops. ii. 35m³/day/ha for market garden type crops. iii. 40-100m³/day/ha for glasshouse etc application.	i. Bulk water allocation based on assumed demand. ii. Water allocations vary based on geology, area etc., factors. iii. About 60% irrigation abstraction metered.
Bay of Plenty Regional Council	14403	774	No specific policy on irrigation water allocations	Only abstractions >400 m³/day are metered
Gisborne Unitary Authority	5411	218	i. No specific policy on irrigation water allocation. ii. User can take up to 4 mm/ha/day.	i. Bulk water allocations based on assumed demand. ii. Water allocations generally do not vary from area to area. iii. About 60% abstractions are metered.
Hawke's Bay Regional Council	13386	3200	i. Unconfined aquifer area 65 mm/ha/fortnight ii. Confined aquifer 70 mm/ha/fortnight	i. Bulk water allocations based on assumed demand. ii. Water allocations vary based on geology, aquifer etc. factors. iii. About 20 water abstractions are metered.

Territorial / Unitary Authorities	Land in Horticulture as at June 1992 (ha) *	Approximate Number of Irrigation Related Consents	Summary of Irrigation Water Allocation Policies	Remarks
SOUTH ISLAND:-				
Canterbury Regional Council	11158	About 2000	i. Pasture and field crops - 550mm/yr or 0.7 l/s/ha ii. Intensive horticulture - 625mm/yr or 0.9 l/s/ha iii. For existing border dyke irrigation - 850mm/yr or 1.01 l/s/ha.	i. Water allocation based on evaporation, soil and crop factors. ii. Water allocations vary based on geology, aquifer etc., factors. iii. About 50% of abstractions are metered.
Otago Regional Council	3501	112	No specific policy on irrigation water allocation.	i. Bulk water allocations based on assumed demand. ii. Water allocations vary based on geology, area etc. iii. Abstractions are not metered.
Southland Regional Council	25966	22	No specific policy on irrigation water allocations.	i. Bulk water allocations based on assumed demand. ii. Abstractions are not metered.
West Coast Regional Council	46	None	None	-
Nelson Unitary Authority	177	About 10	Regardless of aquifer type and soil category maximum water allocation rate allowed is 35 mm/ha/week.	i. Bulk water allocations based on assumed demand. ii. Water allocations vary based on aquifer sustainability and geological conditions of the catchment. iii. Abstractions are not metered.

Territorial / Unitary Authorities	Land in Horticulture as at June 1992 (ha) *	Approximate Number of Irrigation Consents	Summary of Irrigation Water Allocation Policies Related	Remarks
Manawatu-Wanganui Regional Council	5911	700	No specific policy on irrigation water allocations.	i. Bulk water allocations based on assumed demand. ii. Water allocations generally do not vary from area to area. iii. Abstractions are not metered.
Northland Regional Council	4952	175	i. 30 m^3/day/ha of canopy ii. 5m^3/day/ha of shelter	i. Bulk water allocations vary based on geology, aquifer etc., factors. ii. Abstractions are metered.
Taranaki Regional Council	1165	15	No specific policy on irrigation water allocations	i. Bulk water allocation based on assumed demand. ii. Water allocations vary based on geology aquifer sustainability. iii. Most abstractions are metered.
Waikato Regional Council	4775	180	No specific policy on irrigation water allocations	i. Bulk water allocations based on assumed demand. ii. Water allocations vary based on geology, aquifer etc. iii. Only a few major extractions are metered.
Wellington Regional Council	1183	187	Regardless of aquifer type and soil category maximum allocation rate allowed in Wairarapa is 35mm/ha/week. For Wellington an application rate between 20 and 25 mm per week is generally allowed for.	i. Bulk water allocation based on assumed demand. ii. No water permit needed for taking up to 20m^3/day. iii. Water allocations vary based on geology, aquifer etc.factors. iv. All ground water abstractions in Hutt Valley area are metered. v. In future all abstraction >500m^3/day will be metered.

Territorial / Unitary Authorities	Land in Horticulture as at June 1992 (ha) *	Approximate Number of Irrigation Related Consents	Summary of Irrigation Water Allocation Policies	Remarks
Tasman Unitary Authority	6494	657	i. Waimea Plains 35 mm/week maximum, or actual amount applied for ii. Motueka/Riwaka Plains 35 mm/ week maximum, increased to 42 mm/week if scientifically justified iii. Moutere 25 mm/ week increased to 30 mm/week if scientifically justified iv. Everywhere else 35 mm/ week maximum	i. Water allocations based on MAF study for typical crops and soil types of each region ii. Abstractions in fully allocated zones are metered (about 50% of permits)
Marlborough Unitary Authority	3782	Several Hundred	Regardless of aquifer type and soil category maximum water allocation rate allowed is 350m³/ha/week.	i. Bulk water allocations based on assumed demand. ii. Water allocations vary based on aquifer sustainability and geological conditions of the catchment. iii. 100 water abstractions are metered.

*After the Department of Statistics 1992

Fourthly, there is *no incentive for growers to use less water* than the quantity allocated. Water management rests with the grower, who applies water according to criteria that range from the readings from highly sophisticated field monitoring systems of some, to a "seat of the pants" approach of many. How the water is used is a very individual thing. We do not mean to be critical of current practice, but to ask how things can be done better.

Fifthly, the *possible effects of water pollution due to irrigation* are not adequately addressed. Overall irrigation efficiencies tend to be low, and the ratio of 'water applied' to 'water retained' in the rooting zone (the "distribution pattern efficiency" of Painter and Carran, 1978) is important. Irrigators' limited appreciation of crop water requirements, and lack of knowledge of site water dynamics, can lead to either under-watering or over-watering. When the latter occurs, or when heavy intensities result in preferential flow through the soil, fertilisers and pesticides can be leached to underlying aquifers creating a potential hazard. Excess irrigation is non-sustainable and is a wasteful utilisation of the two resources, soil and water, which must never be considered as separate entities.

Discussion - Is Change Needed?

Degradation of soil and water due to "irrigation return flow" is not a modern problem, but today there is more at risk. Twenty years ago, the consequences of excessive irrigation were limited to the leaching of soil nutrients. Now in New Zealand the wider use of a variety of natural and synthetic agrichemicals, often in conjunction with irrigation, has the potential to degrade the soil, surface waters, and groundwater.

Fertliser use has increased in the past two to three years, with total application increasing by 200,000 tonnes from 1989 to 1990 (Department of Statistics Agricultural year Book, 1992). Pesticide use has also increased. About 4000 tonnes of pesticide active ingredients are applied annually, and by the late 1980's their use ranged upward to 118 kg/ha/yr on horticultural land (Wilcock, 1989; Wilcock and Close, 1990).

Excess irrigation water has the potential to transport nutrients and agrichemicals from the active soil layers to deeper layers and then to the underlying groundwater. This is a particular problem where aquifers are unconfined. It is also a potential problem where irrigation wells are drilled deeper than domestic water-supply wells. This irrigation water, when applied to permeable soils, may pollute the shallow water-supply wells with agrichemicals and nitrates.

While the presence of pesticides in groundwater is not a widespread problem in New Zealand, it is starting to occur in certain areas (Close, 1993). The fact that pesticide contamination is not more widespread has been suggested to be more good luck than good management (Beanland and Brown, 1994). The

absence of detectable levels in most areas should be an excellent reason for doing everything possible to avoid future pollution. Now is the time to be effecting prudent policies aimed at reducing the probability. Smarter irrigation practice, facilitated by robust and sound policies, is one way of trying to prevent the problem.

Conclusion

The decision of *when* to irrigate and *how much* water to apply and at *what rate* on a *given piece of land*, for a *particular crop* will always be a complex task for both the irrigators and the resource managers. The time has come to do it better. The reason is to *not only* improve allocation methods and manage what is becoming a scarcer resource on a rational and scientific basis, *but also* to acknowledge that aquifer protection is now involved as well.

Acknowledgement

The authors thank the regulatory staff of various Regional Councils for providing water consent and policy details. Helpful discussions were had with Neale Hudson, Ian Boothroyd, Rob van Voorthuysen (Hawkes Bay Regional Council), Andrew Fenemor, Joseph Thomas (Tasman District Council) and Len Brown (Institute of Geological and Nuclear Sciences). Two anonymous reviewers, Eileen McSaveney and Sue Dryden assisted with the preparation of the paper.

References

Beanland, R.A.; Dravid, D.; Watt, J.P.C. 1994: Irrigation Water Allocation - an Issue for Planners? *New Zealand Planning Quarterly 114:* 6-8.

Beanland, R.; Brown,L.J. 1994: Water purity due to good luck, not management. *New Zealand Planning Quarterly 114:* 9-12.

Close, M.E. 1993: Assessment of pesticide contamination of groundwater in New Zealand. II Results of groundwater sampling. *New Zealand Journal of Marine and Freshwater Research 27:* 267-273.

Department of Statistics, 1992: New Zealand Agricultural Year Book, 1992. *Department of Statistics Publication 14.* New Zealand Department of Statistics, Wellington, New Zealand.

Painter, D.; Carran, P. 1978: What is irrigation efficiency? *Soil and Water 14:* 15-22.

Waugh, J. 1992: Hydrology in New Zealand, *In* Mosely,P. (Ed). *Waters of New Zealand.* New Zealand Hydrological Society.

Wilcock, R.J. 1989: Pattern of pesticide use in New Zealand. Part 1, North Island, 1985-88. *Water Quality Centre Publication 15:* Hamilton, New Zealand.

Wilcock, R.J.; Close, M.E. 1990: Pattern of pesticide use in New Zealand. Part 2, South Island, 1985-88. *Water Quality Centre Publication 16:* Hamilton, New Zealand.

Manuscript Received: 4 July 1994; accepted for publication: 9 January 1995