IRRIGATION TRENDS IN WESTERN U.S.A. AND NEW ZEALAND

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ALTHOUGH western U.S.A. has much more land under irrigation than New Zealand, the percentage of this laad irrigated by surface irrigation is similar in both countries, being 60% in western U.S.A. and 66% in New Zealand.

CLIMATE AND SOILS

Areas irrigated in western U.S.A. have, in general, annual rainfalls less thaa 250 mm with most falling in the winter-spring period. Irrigated areas in New Zealand have, in the main, annual rainfall in excess of 500 mm reasonably distributed throughout the year.

Many of the soils irrigated in western U.S.A. are deep, up to 1 600 m in the Coachella and Imperial Valleys, with most in excess of 5 m. Infiltration rates of these soils are very low, in many cases less than 2.5 mm/h. Land slopes range from 1:2 000 to 1: 100 with most areas in the range of 1: 1 000 to 1: 1 500. New Zealand's irrigated soils are mainly less than 500 mm deep, have initial filtration rates of 100 mm/h and are on land slopes of between 1:40 and 1:400, with most between 1: 150 and 1: 200.

New Zealand is fortunate to have low concentrations of harmful salts in the irrigation water and in the soil. Many water sources in the United States Western Region have salt concentrations of 200 to 3 000 mg/l and many of the soils being irrigated have a high salt content. These factors enforce careful application of water and control of drainage.

SYSTEMS

Gravity irrigation methods used in New Zealand are border strip, contour flooding, wild flooding, border ditch and furrow. American farmers use border strip, furrow, basin and wild flooding. Reticulation of gravity irrigation water in New Zealand is by open, unlined races and the water flows on to the land over a sill. American farmers often use lined races, to keep grass growth out as much as to prevent seepage, and apply water to

the land with siphon pipes. If the supply is in a buried concrete pipe, they use gate valves or gated pipe to deliver water to the furrow or border strip.

Sprinkler irrigation methods used in New Zealand are hand move, 45 degree end tow, side roll (power or manual), winch type with giant guns and solid set. American farmers use similar plants as well as side rolls with trailing pipe and centre pivots. Centre pivots are the fastest growing type of sprinkler irrigation in the Western Region. As well, each country has its group of farmers using trickle or drip irrigation. Drip irrigation is becoming increasingly popular in America. Drip is being used to irrigate citrus crops on slopes of up to **1: 1.** It is replacing solid set and hand move sprinklers in orchards and vineyards, and is being used in Hawaii on sugar cane. Some crops and areas which have been traditionally surface or sprinkler irrigated, are being irrigated by drip. Some of the reasons, for this are: (1) The ability to match the infiltration of the soil; (2) Prevention of run-off, thus saving water; (3) Prevention of salt burn on plants; (4) It can be fully automated; (5) Costs are similar to solid set sprinklers.

METHODS

Methods of surface irrigation used in the Western Region vary from graded corrugated strips, furrows and border strips to contour border strips and basins that cover up to 12 ha. Furrows and border strips with runs of 2 000 m are used, with 400 m being the average. A large proportion of surface is on furrows or beds and a wide, range of crops are irrigated in this way. A large amount of border strip irrigation is corrugated. Corrugations are not used in New Zealand, although they offer an advantage in that greater tolerance is permissible between levees. Flat border strips are narrower than the 12 m width used in New Zealand, even though the cross-section is flatter. The reasoa is the cost and operator expertise needed to cross level over any distance greater than the width of the machine blade.

Automation of irrigation is of great importance to the American farmer. In the past, when labour and water had been cheap and plentiful, little attention was paid to the method of applying water to the land. Rising labour costs and demand for water from dry areas have made the farmer conscious of this high labour input and wasteful use of water. Humpherys (1967) developed drop gate systems and release units similar to that used in New Zealand, for use with open channel surface irrigation. Humpherys

(1974) and Fishback (1974) have developed workable pneumatic systems for use with gated pipe. These appear to have potential, but their future success depends on proving to the farmer that they work. Also, land preparation methods and design may have to be examined to obtain maximum potential from their release controls. On many sites, the American construction technique is to level to a uniform longitudinal grade with no side fall, in some instances, bays of 30 to 100 m wide having a cross fall of less than 30 mm. This is very costly and it is the writer's opinion that the New Zealand system of levelling to no adverse fall longitudinally, with cross levels to within 1: 240 'would be satisfactory and certainly less expensive.

At present, the American farmer would rather move into sprinkler methods of applying water, and this tendency is the one where Western Region irrigation differs from the approach in New Zealand. New Zealand has developed a workable drop gate system for open channel use and farmers are able, in many areas, to construct border strip irrigation at a capital cost below that of sprinkler, and with water use efficiency similar to that of sprinkler irrigation. The Americans are turning to sprinkler irrigation even when they have flows greater than 200 l/second. The opposite has happened in New Zealand where some farmers have replaced sprinklers with an automatic border strip system.

MULTI-PURPOSE USES

Much of the water in the Western Region of 'the United States is used several times and in different ways. The public make extensive use of the lakes and reservoirs for swimming, boating and fishing. Municipal water is reused in agriculture. Such multiple use ad stored water allows the cost of projects to be spread over several different users, thus reducing the cost to any one sector. This type of planning is beginning to emerge in New Zealand and it must be encouraged if we are to enjoy, fully, a resource which we have in abundance.

REFERENCES

Fishback, P. E., 1974: *Irrig. Age, 9: 12.*
Humpherys, A. *S., 1967: Agric. Engng, 48:* 338-40.
——— *1974: Irrig. Age, 9: 36.*