HOWWET: TRACKING FALLOW SOIL MOISTURE

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HOWWET is a computer programme which uses farmer rainfall records to estimate how much rain has been stored and how much nitrogen has been mineralised in soil during the fallow between crops. The WINDOWS? based HOWWET functions as an educational tool as well as a user-friendly decision support aid. Plant available water is calculated by keeping track of daily evaporation, rainfall and runoff. The outcomes can be modified by changing levels of management (through cover), soil water-holding capacity and climate.

Inputs have been simplified by providing a range of soil types and climate localities. Default plant-available water capacities can be overwritten in the programme to customise a soil response. Tables of weekly temperatures and evaporation rates are held for each location. The hydrology component of HOWWET is derived from the PERFECT and APSIM models (John Dimes, pers. commun.)

Rainfall is entered in a calendar format of *rain* days. Files of rainfall can thus be stored separately or appended to form a large calendar from which subsets of rainfall can be chosen. District rainfall data can be entered from public domain meteorological files, but generally the intention of HOWWET is to develop farmers' experience in relating local weather patterns and the storage of water in their soils.

Output from HOWWET is given either as a table of total rainfall, runoff and evaporation for a period or as a series of graphs depicting the plant available water in the soil profile. Since the algorithm for evaporation considers water loss only from the surface 200 mm, the graphs show the daily fluctuation of soil water in the surface layer and the accumulation of water in the lower *safe* layer of the soil profile. A rainfall histogram is overlain by runoff bars when runoff occurs.

Mineralised nitrogen for the fallow period is given as a single value or as a graph showing daily accumulation in juxtaposition with graphs of daily temperatures and soil moisture in the surface layer. Denitrification under ponded conditions is not considered. A summary of daily rainfalls is available as a calendar table of as a combined graph with a monthly histogram of actual rainfall being superimposed over a line of average monthly rainfall for the chosen location.

RESULTS AND DISCUSSION

In general, HOWWET satisfactorily estimated the observed total plant available water content of soils at the end of a fallow. In a comparison with 5 locations in south-east Queensland (100 observations), the root mean standard deviation was 31 mm. This is only slightly higher than Littleboy *et al.* (1) achieved with PERFECT (35 observations, RMSD = 28 mm) and is encouraging for such a simple model which has no drainage component. HOWWET closely predicted runoff especially for fallows with observed runoff between 50 and 170 mm. The overall RMSD for runoff predictions was 20 mm.

REFERENCES

1. Littleboy, M., Silburn, D.M., Freebairn, D.M., Woodruff, D.R. and Hammer, G.L. 1989. Queensland Dept. of Primary Industries Bulletin QB 89005. (Brisbane: QDPI.). 119 pp.