SELECTED SOIL PHYSICAL PROPERTIES AND THEIR AFFECTS ON CEREAL YIELDS IN THE MANAWATU-RANGITIKEI REGION, NEW ZEALAND

A thesis presented in partial fulfilment
of the requirements for the Degree of
Master of Science in Soil Science
at Massey University.

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1986

ABSTRACT

The Manawatu-Kairanga-Rangitikei region is now a major cropping district in New Zealand. Expansion and intensification has led to a need for more specific information on soil physical properties and how these properties interact with crop yield and soil management.

Soil physical properties largely determine the rooting depth and available water storage capacity of a soil-crop system. Compacted subsoils (1.5-1.7 Mg/m^3), low saturated hydraulic conductivity (0-10 mm/hr), and poor aeration (0-5% large pores) were the probable causes restricting root depth in the six high terrace soils (Kiwitea mottled, Marton, Tokomaru silt loams) investigated. The two river plain soils (Kairanga silt loams) gave results which indicated a more suitable rooting environment than the high terrace soils.

Restricted rooting depth led to low (65-80mm) total available water contents (TAWC) for the high terrace soils and higher, but more variable, TAWC (80-116mm) for the Kairanga soils.

A simple soil water balance model allowed soil water storage and climate to be integrated to estimate periods of moisture stress. In the year of this study (1985/86) there was a range in moisture stress days (0-27 days) dependant on soil type. However, there was no correlation between the computed number of moisture stress days and crop yield. This was due to an unusual wet spring-summer growth

season. Thus other factors, probably related directly and indirectly to poor drainage and aeration, affected yield more than moisture stress. Extended to different climatic seasons, the model predicted that 25-64 moisture stress days would occur in a drier season, depending on soil type. This is predicted to cause a 40% and 20% reduction in yield due to moisture stress for the high terrace soils and a Kairanga soil respectively.

ACKNOWLEDGEMENTS

I wish to express hearty thanks to my supervisors; to Dr. A.S. Palmer for his continual guidance, encouragement, and friendship; and to Dr. P.E.H. Gregg and Dr. D.R. Scotter for their invaluable assistance and constructive criticism during my work.

I would also like to thank M. Eggels for his assistance with some computing; Dr. N.J. Withers, Dr. J.M. de Ruiter and East Coast Fertilisers for providing information used in this study; and to the farmers who allowed their soils to be sampled.

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