AN EXPERT SYSTEM FOR MAKING FERTILIZER RECOMMENDATIONS

A thesis
in fulfillment of requirements for the degree of
Master of Applied Science

by

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ABSTRACT

Developing fertilizer recommendations based on the results of soil analysis is recognized as a standard practice in horticultural crops. The manual process requires expert knowledge and can be tedious and time consuming. This thesis reports the results of research undertaken to develop an expert system for making fertilizer recommendations. Study objectives were to explore and describe methods for the implementation of the interpretation model and the generation of fertilizer recommendations using a user interface that is highly interactive and effective as well as demonstrating the commercial feasibility of such a system. Incremental prototype development occurred both in the DOS and Windows environment, with the Windows version being more commercially acceptable and maintainable than the DOS version. The review of the prototypes by a small team of domain experts proved to be a successful method for iterating through the prototype development system life cycle. At the core of the system is a knowledge base maintained in tabular format and a linear model which resolves an optimum fertilizer recommendation solution that meets certain goals while satisfying a set of constraints. The provision of mixed initiative dialogues that support user exploration of the solution space using the results from the linear model is also reported. Pilot commercialization through a jointly funded project by the co-operating fertilizer company, Incitec and the Horticultural Research and Development Corporation was successfully undertaken and full commercialization is being funded fully by Incitec. Results from this study indicated that the system developed was commercially acceptable as a delivery platform for fertilizer recommendations.

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This work was carried out while I was employed as an Extension Officer, Horticulture Branch with the Queensland Department of Primary Industries. For the duration of the project I was stationed at Bundaberg and used the computing facilities of the Bundaberg town office. Project travel and library services were financed from Queensland Department of Primary Industries funds.

I am indebted to my primary supervisor, Professor John Smith, for his encouragement and guidance during the project. His enthusiasm and technical competence helped make this project intellectually rewarding for me. Unfortunately Professor Smith did not live to see the completion of this thesis. After the untimely death of Professor Smith, Dr. Saleh A. Wasimi became my principle supervisor and guided me in the final phases of my studies.

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Throughout the project I received support from my wife and family.

DECLARATION

To the best of my knowledge and belief, the work presented in this thesis is original, except as acknowledged in the text. All sources used in my work have been cited, and no attempt has been made to present the contributions of other researchers as my own. The material has not been submitted, either in whole or in part, for a degree at this or any other University.

Garry Fullelove