

Design of Environmental Performance Measurement Systems for Agriculture

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A thesis submitted in fulfilment of the requirements for the degree of
Doctor of Philosophy

2016

Accounting Discipline Group
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Certificate of original authorship

I certify that the work in this thesis has not previously been submitted for a degree, nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Ha Thanh Pham

Acknowledgements

This thesis would not have been possible without the contribution of a number of people. I would like to thank my supervisors, David Brown, Bruce Sutton and Paul Brown for your mentoring and insight throughout my PhD journey. I would like to thank David for his guidance and feedback, particularly regarding management accounting. I would like to thank Bruce for his support and insightful comments and suggestions regarding water and crop science. I would like to thank Paul for his enthusiasm for my study and his great support, particularly with economic modelling.

I would like to thank the Cotton project team – David Brown, Bruce Sutton, Paul Brown, Paul Thambar, Kai Jin, Nicole Sutton, Dianne Hiles, Anthony Krithinaki and Suzie Nguyen. I also acknowledge the help of Tommaso Armstrong for his assistance in simulation modelling and Ian Ly for his assistance in editing tables and figures of the thesis. I really appreciate the help of Shona Bates in editing the final version of this thesis.

I would like to acknowledge the comments and suggestions from the UTS visitors: Hugh Willmott, Gerhard Speckbacher, Martin Messner, Steven Sutton, Arnold Vicky, Angelo Ditillo, Lars Freemason, Dan Dhaliwal and Jere Francis.

I would like to thank the UTS Management Accounting Research Collaborative (MARC) group, particularly Prabhu Sivabalan and David Bedford, for their encouragement, comments and suggestions. I would like to acknowledge the support as well as comments and suggestions from the UTS Accounting Discipline Group, particularly Martin Bugeja, Steven Taylor, Zoltan Matolcsy, Jonathan Tyler, Bernhard Wieder, Roman Lanis, Robert Czernkowski, Brett Govendir, Anna Loyeung and Helen Spiropoulos.

I would like to acknowledge the institutional support I have received from the Accounting Discipline Group at UTS. I would like to thank Peter Wells for giving me the opportunity to start the PhD and particularly to Martin Bugeja, Jonathan Tyler and Anna Wright for their encouragement and for always ensuring I received adequate support. Special thanks go to the administrative staff, Judith Evans, Katt Robertson, Neil James and Ann-Marie Hopps, for helping me navigate the bureaucracy.

The support and friendship from a number of other people have also contributed to making the completion of this thesis both interesting and enjoyable; in particular, Anna Loyeung, Katt Robertson, Helen Spiropoulos, Amanda White, Rachael Lewis, Ann Usarat, Matthew Grosse, Nelson Ma, Samir Ghannam, James Wakefield, Kai Jin, Brett Govendir, Robert Czernkowski, Ross McClure, Thulaisi Sivapalan, Alexey Feigin, Steven Kean and Jin Sug Yang.

I give special thanks to my wonderful Mum, who has always supported and encouraged me to pursue my academic career. To my Dad and my sister, two incredible scientists who created and nurtured my interest in science and research, and inspired me to complete this work, I am sure that you would both be very proud of me if you knew my achievement.

Finally, and most importantly, I would like to thank my husband and my son, without whom this thesis would not have been completed, nor worth it. Your constant support, love and encouragement over the last 5 years, the sacrifices you made, and your continual understanding of the hard work involved have made this thesis possible. For this reason, this thesis is dedicated to the two of you.

Abstract

The research question addressed in this thesis is: how can Environmental Performance Measurement Systems (EPMS) be *designed* and *used* in an agricultural setting to support managers in water and economic sustainability-related decision making and control.

Sustainability and the increasing scarcity of natural resources such as freshwater are of growing social interest. Agriculture has a significant impact on the sustainability of freshwater at both global and local levels. As agriculture is economically and socially significant in meeting human needs for food and clothing, it is surprising that there has been very little management accounting research conducted within an agricultural setting and almost none on its role in environmental sustainability.

Extant EPMS research manifests two underlying theoretical problems, which are also reflected in broader performance measurement systems research. First, the research provides little insight into how to design *valid* environmental performance measures which could provide managers with precise information to enable decision making and control over environmental sustainability. I argue that there are two key reasons for this: that theories from natural science are yet to inform EPMS design; and that while environmental management typically occurs at an operational level, EPMS typically reside at the organisational level. The second theoretical problem is the lack of existing research that considers how environmental performance standards can be developed for use as *targets* to support managers in improving sustainability-related decision making and control.

I address these two problems with a new theoretical construction of a multi-level decomposition EPMS model - which I label, Water and Economic Sustainability Performance Measurement (WESM). The model integrates science into an accounting framework. This design overcomes the two key challenges with EPMS validity. I subsequently examine how the WESM model can be used to support managers in improving sustainability-related decision making and control using a two- phased crop production simulation modelling approach. The simulation results provide significant implications for the cotton industry (and agriculture more broadly) with the potential to save hundreds of ggalitres of water and increase profitability by tens of millions of dollars per crop season for cotton farming in Australia.

The research also makes a theoretical contribution to the accounting literature by developing and applying theory from science to overcome inherent validity and target setting problems in PMS design. In addition, I demonstrate the usefulness of simulation modelling as a research method, which has yet to have a great deal of application in accounting research designs beyond few costing studies.

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