EVALUATION OF THE PRIVATE AND SOCIAL COSTS OF AN ON-FARM BIODIVERSITY CONSERVATION PROGRAM IN WESTERN NEW SOUTH WALES

A major dissertation submitted in partial fulfilment of the requirements for the degree of Master of Economics of the University of New England

by

JONATHAN FRANCIS MOSS
BAppSc(EnvHort) *CSturt*, GDAgEc *UNE*

School of Business, Economics and Public Policy
Faculty of The Professions
University of New England
Armidale NSW 2351

September 2008

CERTIFICATION

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

…………………………………......

(Jonathan F. Moss)

ACKNOWLEDGEMENTS

I am indebted to my supervisors Associate Professor Jack Sinden and Richard Stayner who have provided me with indispensable advice, encouragement and notably patient guidance during my period of candidature. I am extremely grateful for the time and opportunity they have afforded me through their mentoring.

In addition, I would like to thank the following people for their contribution to this study: Professor Brian Hardaker for his expert advice on the stochastic simulations; Adjunct Associate Professor Brian Wilson and Dr Ian Oliver from the Department of Environment and Climate Change for their advice on measuring biodiversity in the Western Division; my colleague Mark Blair for his advice on biodiversity change in the EBC conservation areas; former project officers with WEST 2000 Plus Renee Shepherd and Angus Atkinson for their provision of data and background information on the West 2000 Plus EBC scheme; Rory Treweeke from the Western CMA for his comments on the pilot survey; all the participants of the West 2000 Plus Enterprise Based Conservation pilot project for their cooperation and willingness to provide economic data; Dr Ron Hacker and the staff at the Trangie DPI for their advice and provision of parameter sets for the GRASP software; Jeff Thompson from the Institute for Rural Futures for the generation of the map showing the Western Division and location of the EBC participants' properties.

I am grateful to West 2000 Plus and the NSW Department of Natural Resources (now Department of Environment and Climate Change) for the scholarship which enabled me to undertake this study.

Also, I would like to thank John Pearson for his mentoring and encouragement to pursue higher education throughout the years.

Finally, my family and friends for all their support, encouragement and prayers.

ABSTRACT

Native vegetation, and its associated biodiversity, are becoming scarce in Australia and therefore valued resources to society. A significant quantity of native vegetation exists on privately managed farmlands, and so these landholders can play an important role in management and conservation. They do not, however, always conserve biodiversity at a level society desires because they do not receive the appropriate market signals. Consequently, regulations and other policy measures to protect native vegetation on farms have been introduced in all jurisdictions of Australia. But these regulatory policies can impose substantial costs to landholders, and may be ineffective in the provision of biodiversity and environmental outcomes, so they need to be continually reviewed.

Recently the use of Market Based Instruments (MBI's) has received considerable attention. These instruments are based on the premise that the socially optimal level of biodiversity is not being conserved due to market failures. They are used to create a market that provides both incentives and signals to farmers to produce improved levels of environmental goods and services.

The Western Division of New South Wales has primarily been used for grazing sheep on native pasture, and is characterised by large properties and marginal climatic conditions. Environmental issues in the region include soil erosion, encroachment of woody weeds and the decline of the pasture and groundcover conditions. Currently less than eight per cent of the Western Division is formally managed with conservation objectives, however the Western Catchment Management Authority hopes to raise this to 25 per cent conservation by 2035. This, amongst other factors has led to an interest in MBI's as a method of increasing conservation outcomes in this region.

The aim of this study is to undertake an economic assessment of a MBI biodiversity conservation scheme introduced to western NSW. The scheme is the West 2000 Plus Enterprise Based Conservation (EBC) scheme which is a pilot project running from 2003-2008. This scheme created a market for biodiversity by providing landholders with an annual incentive payment, for which they bid, in exchange for the provision of specified environmental services. Two different methods of providing these services were available to landholders. The de-stock approach involves landholders removing all domestic stock

and controlling feral animals, in exchange for an accepted annual incentive payment. The groundcover approach allows landholders to receive annual incentive payments in exchange for ensuring groundcover levels are above a given threshold, regardless of their stocking or management practices.

Any policy which removes land from agricultural production involves opportunity costs to the landholder. The economic analysis derives cumulative cost curves to demonstrate the opportunity costs of supplying levels of biodiversity from the different farms, both from the perspective of the private landholders and the broader society. A deterministic analysis was conducted first to determine these opportunity costs. Given the uncertainty of both the market and climatic conditions, a stochastic analysis was then conducted to determine the implications of this uncertainty.

The stochastic analysis required the development of an existing pasture growth model (GRASP) to allow climatic variables to be treated stochastically. A simulation system, comprising a pasture growth model, a grazing flock dynamics model, an animal consumption model and economic models, was developed to model the EBC policies over the range of climatic and market conditions. The use of this simulation system also allowed for the simulation of, and determination of the costs in, biophysical changes that can be expected as a result of the EBC project.

The results of the deterministic model showed that the average discounted benefit to landholders for their participation from 2003 to 2007 was \$2.36 per hectare, but this ranged from the imposition of a cost of \$30.51 per hectare to a benefit of \$13.04 per hectare. The average discounted social cost for the same time period was \$11.02 per hectare with a range from \$3.00 to \$161.81 per hectare. Simulations with the stochastic analysis estimated that the average discounted benefit to landholders for participation over a five year period to be \$6.61 per hectare with a range between a cost of \$40.53 and a benefit of \$61.59 per hectare.

A major finding from the generation of cumulative cost curves was that a single policy may not be the most efficient method of conserving biodiversity on farms, and that a combination of policies may be more appropriate to obtain the desired levels of biodiversity conservation while meeting budget constraints.

Further, landholders did not necessarily have to make a trade-off between the lower variability of income with the EBC annual incentive payments and the higher incomes from traditional agricultural production. In four of the five case studies, the annual incentive payments were accompanied by less expected variability and a higher expected income than in traditional agricultural production.

In order to present costs in terms of biodiversity benefits, four units were applied to measure biodiversity outputs. These were unadjusted hectares conserved, potential-biodiversity adjusted hectares, additional gain in total standing dry matter, and increase in groundcover levels. An important finding from this study was that the method chosen for measuring biodiversity influenced the shape of the cumulative cost curves and therefore policy recommendations.

A major policy concern is whether landholders undertaking the groundcover approach, in the absence of annual incentive payments, would be economically better off than staying with their traditional approach. Results, from simulations conducted on two case study properties, over a five year period, however, did not show they would be better off.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES