Using the Collective Identity Construct
to Examine the Role of a Farmer
Occupational Identity in
Multi-functional Landscapes in
Australia and the United States

Theresa M Groth

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Supervisors: Professor Allan L Curtis
Dr. Emily K Mendham
Dr. Eric Toman (The Ohio State University, USA)
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Theresa M Groth
Bachelor of Business Administration, Saginaw Valley State University, Michigan, USA; Master of Science, Michigan State University, Michigan, USA

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# Table of Contents

Certificate of Authorship ................................................................. xii
Acknowledgements ............................................................................. xiii
Publications arising from this research ............................................. xiv
List of acronyms .................................................................................. xvi

ABSTRACT ............................................................................................... xvii

CHAPTER 1 - INTRODUCTION ................................................................. 1
  Rationale ............................................................................................... 1
  Research aims ..................................................................................... 3
  Methodology, methods and analysis ................................................... 4
  Thesis outline ...................................................................................... 10
  Comments on the structure and content ........................................... 11

CHAPTER 2 – A LITERATURE REVIEW .................................................... 12
  Introduction ......................................................................................... 12
  Collective identity overview .............................................................. 14
  Foundational footing of the collective identity construct (CIC) ......... 16
    Symbolic Interactionism .................................................................. 17
    Personal identity ............................................................................ 18
    Identity Theory .............................................................................. 19
      Components of identity in Identity Theory .................................. 19
      Change in identity ........................................................................ 22
    Social Identity ................................................................................. 23
    Social Identity Theory .................................................................... 24
    Self - Categorisation Theory .......................................................... 25
    Nigrescence Model ......................................................................... 25
  Identity overview .............................................................................. 27
  Self, self-concept and self-esteem ...................................................... 28
  Place based identity ......................................................................... 30
  Assessing occupational identity amongst rural landholders ............ 31
  Measuring collecting identity: The collective identity construct (CIC) .............................................................................. 33
    The seven dimensions of the CIC ................................................... 36
      Self – categorisation .................................................................... 36
      Evaluation .................................................................................... 39
    Importance ...................................................................................... 40
    Attachment and sense of interdependence ..................................... 42
    Social embeddedness ..................................................................... 46
    Behavioural involvement .............................................................. 46
    Content and meaning ..................................................................... 48
  Review of CIC ................................................................................... 52
  Occupational community ................................................................. 52
    Importance of an occupational identity ......................................... 55
    Occupational title ........................................................................... 56
    Occupational identity and the collective identity construct .......... 57
  Landholder classification .................................................................. 59
    Typology ......................................................................................... 59
    Farmer identity and classification into landholder typology .......... 60
    Landholder land management practices ....................................... 64
Use of theory in predicting behaviour.......................................................... 65
Conclusion........................................................................................................ 69
CHAPTER 3 METHODS .................................................................................... 71
Introduction...................................................................................................... 71
Research paradigms & methodology ............................................................. 71
  Pragmatism..................................................................................................... 71
  Pragmatism and mixed methods................................................................. 72
Research design: A mixed methods approach .............................................. 73
Research design............................................................................................. 75
  Key research questions................................................................................ 75
An overview of my research approach......................................................... 75
Timing of data collection, analysis and interpretation..................................... 79
Qualitative data.............................................................................................. 81
  Study sites................................................................................................... 81
    Wayne County, Ohio, United States site selection.................................... 82
    Shire of Campaspe, Victoria, Australia site selection.............................. 84
Data collection and analysis ......................................................................... 86
Informant selection......................................................................................... 87
Interview process............................................................................................ 94
The practice of transcription – an overview............................................... 97
The practice of interview data analysis – an overview................................ 98
Transcription of interview data and abductive coding – in practice.............. 99
Interview data analysis................................................................................. 100
Quantitative data.......................................................................................... 104
  Study site: North Central Catchment Management Authority area ............ 104
Surveys........................................................................................................... 105
Surveying landholders................................................................................ 106
Survey development...................................................................................... 108
Analysis of regional mail surveys............................................................... 115
Scale development......................................................................................... 116
  Data transformation.................................................................................... 116
  Missing values............................................................................................ 120
  Development of the scale.......................................................................... 122
Cluster Analysis............................................................................................. 124
General linear models.................................................................................. 125
Validity & reliability..................................................................................... 127
  Validity........................................................................................................ 127
    Qualitative validity.................................................................................. 127
    Quantitative validity............................................................................... 128
  Triangulation............................................................................................... 128
  Validity checks in this research................................................................. 129
Reliability........................................................................................................ 130
  Qualitative reliability................................................................................ 130
  Quantitative reliability............................................................................. 130
  Internal consistency.................................................................................... 131
  Reliability checks in this research............................................................. 131
Challenges...................................................................................................... 132
Ethical considerations.................................................................................. 133
CHAPTER 4 RESULTS – RESEARCH QUESTION ONE A & B ...................... 135
The utility of a collective identity construct to explore the influence of farming identity on natural resource management ........................................... 135
Research approach ........................................................................ 135
Introduction .................................................................................. 135
Background to USA case study ..................................................... 137
Background to Australian case study ........................................... 138
Data collection and analysis ......................................................... 138
Findings ....................................................................................... 141
Discussion and conclusion ............................................................ 148

CHAPTER 4 RESULTS – RESEARCH QUESTION ONE C ................... 150
The development and validation of a collective occupational identity construct (COIC) in a natural resource context ........................................ 150
Abstract ...................................................................................... 150
Approach ...................................................................................... 150
Study site, sample size and selection of landholders .................... 150
Survey format .............................................................................. 153
Missing values ............................................................................ 155
Data Analysis: tests to be applied ................................................. 156
Results ....................................................................................... 157
Reliability of survey items to form a collective occupational identity construct scale ................................................................. 157
Exploratory Factor Analysis .......................................................... 161
Validity of the collective occupational identity construct scale .... 163
Testing the COIC scale against self-declaration into 3 types of landholders .......................................................... 164
Discussion and Conclusions ......................................................... 165

CHAPTER 5 RESULTS – RESEARCH QUESTION TWO ..................... 168
Examining the agricultural producer identity: Utilising the collective occupational identity construct to create a typology and profile of rural landholders in Victoria, Australia ......................................................... 168
Abstract ...................................................................................... 168
Background and Approach ............................................................. 168
Background of study area .............................................................. 168
Approach to data collection .......................................................... 170
Analysis of survey data ................................................................. 173
Results ....................................................................................... 174
Cluster formation ........................................................................ 174
Cluster interpretation ................................................................... 175
Cluster profiling .......................................................................... 176
Cluster 1: ‘Non-farmers’ ............................................................... 176
Cluster 2: ‘Hobby farmers’ ............................................................ 177
Cluster 3: ‘Part-time farmers’ ......................................................... 184
Cluster 4: ‘Full-time farmers’ ....................................................... 184
Discussion and conclusion ............................................................ 185

CHAPTER 6 RESULTS – RESEARCH QUESTION THREE .................. 189
What is the nature of the relationship between farmer identity and the land management of rural landholders? ........................................... 189
Introduction .................................................................................. 189
Approach to analysis .................................................................... 189
Addressing potential bias in results .............................................. 189
Selection of dependent variables .................................................................................. 190
Selection of independent variables ........................................................................... 192
Approach to general linear model testing ................................................................. 201
Findings ....................................................................................................................... 203
An overview ................................................................................................................. 203
Examination of individual landholder behaviours ..................................................... 205
Land sown to perennial pasture and lucerne .............................................................. 205
Spent time controlling pest animals and non-crop weeds ........................................ 216
Tested soils for nutrient status where fertiliser/soil conditioners were applied 223
Area with at least one lime application over the full period of management .. 232
Area of native bush / grassland fenced to manage stock access ......................... 241
Conclusion .................................................................................................................. 255
CHAPTER 7 – CONCLUSION ..................................................................................... 256
Recap of the research process .................................................................................. 256
Reflection of the approach ......................................................................................... 258
The pragmatic worldview ......................................................................................... 258
Research impediments and solutions .................................................................... 260
Drawing upon theory ................................................................................................. 262
Lessons learned ....................................................................................................... 263
Key findings .............................................................................................................. 265
Contribution of research ......................................................................................... 270
Implications for policy and management ............................................................... 274
Future research ....................................................................................................... 276
REFERENCE LIST .................................................................................................... 280
Appendix A - NVivo Nodes used for coding and the corresponding definitions ...... 300
Appendix B North Central Catchment Management Authority survey ............... 304
List of Tables

Table 1 Overview of key research questions and approach to qualitative and quantitative data analysis .......................................................................................................................... 9
Table 2 Cross's (1991) Racial Identity Scale ......................................................................................... 26
Table 3 Collective Identity Construct dimensions, adapted from Ashmore et al. (2004) .................................................................................................................................................. 34
Table 4 Representative Measures of Identity: Self - Categorisation (adapted from Ashmore, et al (2004)) ........................................................................................................................................... 37
Table 5 Representative Measures of Identity: Evaluation (adapted from Ashmore et al (2004)) ................................................................................................................................. 39
Table 6 Representative Measures of Identity: Importance (adapted from Ashmore et al (2004)) ................................................................................................................................. 40
Table 7 Representative Measures of Identity: Attachment and Sense of Interdependence (adapted from Ashmore et al. (2004)) ................................................................................ 45
Table 8 Representative Measures of Identity: Behavioural Involvement (adapted from Ashmore et al. (2004)) .................................................................................................................. 47
Table 9 Representative Measures of Identity: Ideology (adapted from Ashmore et al. (2004)) ........................................................................................................................................... 50
Table 10 Mixed method implementation to answer research questions ................................................. 77
Table 11 Timeline of data collection and analysis ................................................................................. 80
Table 12 Landholder cohort defining characteristics a ........................................................................... 88
Table 13 Interviewee attributes ............................................................................................................... 90
Table 14 Informant attributes ................................................................................................................ 93
Table 15 Qualitative assessment of the ability (usefulness) of the CIC dimensions to distinguish full-time, part-time and non-farmer rural landholders in AU and USA .......... 103
Table 16 Occupational Identity and CIC survey items ......................................................................... 112
Table 17 Natural jenks produced categories in social interactions with full or part-time farmers ................................................................................................................................. 117
Table 18 Property size categories based upon CMA judgment ............................................................ 119
Table 19 Categorical classification of hours worked per week on property ........................................ 119
Table 20 Likert scale / category rules developed to assess farmer identity in the importance dimension ...................................................................................................................... 121
Table 21 Data distribution of farmer identity within the importance dimension .................................. 122
Table 22 Informant attributes ................................................................................................................ 142
Table 23 Qualitative assessment of the ability (usefulness) of the CIC dimensions to distinguish full-time, part-time and non-farmer rural landholders in Australia and the USA ................................................................................................................................. 143
Table 24 CIC dimensions suggested for future quantitative studies with examples of survey items ........................................................................................................................................... 149
Table 25 Survey items used for testing the reliability of a collective occupational identity construct scalea ........................................................................................................................ 158
Table 26 Reliable collective occupational identity construct dimensions and related elements ................................................................................................................................. 162
Table 27 Correlation between Collective Occupational Identity Construct scale and proxy variables ................................................................................................................................. 163
Table 28 Calculating effect sizes for pairwise comparisons of landholder cohort and COIC scores ........................................................................................................................................... 164
List of Figures

Figure 1 Model for two hierarchically arranged identities within a person (Burke & Stets, 2009) ................................................................. 20
Figure 2 Individual-level Collective Identity Construct adapted by Ashmore et al., (2004) ................................................................. 35
Figure 3 Example of interview transcript coding in NVivo ........................................... 100
Figure 4 Visual representation of relationship between respondents within and between cohorts based upon CIC relevance ......................................... 101
Figure 5 Median values by cluster using K-means method ........................................ 174
Figure 6 Knowledge of Soils scree plot .............................................................. 201

List of Maps

Map 1 Ohio, United States study site ...................................................................... 6
Map 2 Victoria, Australia study site ....................................................................... 6
Map 3 United States Study Site - Wayne County, Ohio ...................................... 82
Map 4 Australia Study Site - Northern Campaspe Valley, Victoria, AU .......... 85
Map 5 North Central Catchment Management Area, Victoria, Australia ....... 105
Map 6 Study site locations .................................................................................. 138
Map 7 North Central Catchment Management Authority region study site .... 152

List of Boxes

Box 1 Semi-structured interview guide ............................................................... 95
Box 2 Qualitative data analysis steps ................................................................. 102
Box 3 SPSS Data preparation/analysis steps .................................................... 115
Box 4 Property size categories as found in the literature ............................... 118

List of Images

Image 1 Average landscape views in Wayne County, Ohio, USA ..................... 84
Image 2 Average mixed farm in Wayne County, Ohio, USA .......................... 84
Image 3 Average landscape views in the Shire of Campaspe, Victoria, AU .... 86
Image 4 Irrigation channel in the Shire of Campaspe, Victoria, AU ............... 86
Certificate of Authorship

I hereby declare that this submission is my own work and to the best of my knowledge and belief, understand that it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Charles Sturt University or any other educational institution, except where due acknowledgement is made in the thesis [or dissertation, as appropriate]. Any contribution made to the research by colleagues with whom I have worked at Charles Sturt University or elsewhere during my candidature is fully acknowledged.

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Theresa M Groth

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Publications arising from this research

Peer-reviewed journal papers


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Fact sheets


CONFERENCE PRESENTATIONS

International conference presentations


Other presentations


List of acronyms

ABS – Australian Bureau of Statistics
AU – Australia
CIC – Collective Identity Construct
CMA – Catchment Management Authority
COIC – Collective Occupational Identity Construct
CRP – Current recommended practices
CSU – Charles Sturt University
FTF – Full-time farmers
GLM – General Linear Model
IT – Identity Theory
LGA – Local Government Area
LR – Logistic Regression
MCAR – Missing Completely at Random
NC CMA – North Central Catchment Management Agency
NF – Non-farmers
NR – Natural resource
NRM – Natural Resource Management
OI – Occupational Identity
PCA – Principal Component Analysis
PTF – Part-time farmers
SCT – Self-Categorisation Theory
SIT – Social Identity Theory
TPB – Theory of Planned Behaviour
USA – United States of America
VBN – Values-Beliefs-Norms
VIF – Variance Inflation Factor
ABSTRACT

Substantial prior research has described an increasing diversity of rural landholders in developed countries including an increasing proportion of non-farmer landholders. These population changes present important challenges to social researchers seeking to interpret behaviours within these landscapes, including identifying different types of landholders and potential influences on natural resource management decisions. A myriad of items have previously been used to classify landholders. However, most of those efforts have been atheoretical. Additionally, the selection of items has varied widely from one context to another making comparisons across studies problematic.

That gap provided the basis for this inquiry into the nature and role of farmer occupational identity in natural resource management (NRM). This research utilised the Ashmore et al. (2004) collective identity construct (CIC), a multidimensional sociopsychological measure. This highly cited construct incorporates theories related to collective identity and identity formation into one comprehensive framework. This seven-dimension construct has been utilised in other fields, but had not previously been employed in a natural resource context. This construct provided the framework for addressing three main research questions of this research:

1 – Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?

2 – Can a farmer occupational identity scale based on the CIC provide a valid and reliable theory-based typology of rural landholders?

3 – What is the nature of the relationship between farmer identity and the land management of rural landholders?

A mixed methods approach is utilised in a comparative study of rural landholders in Ohio, United States and Victoria, Australia. Forty semi-structured interviews with landholders in north east Ohio (20 interviews) and north central Victoria (20 interviews), in addition to a postal survey of approximately 2,000 landholders in north central Victoria provided the data to address the research questions. The qualitative data was recorded, transcribed verbatim, and analysed using deductive coding. For
each landholder, the seven CIC dimensions were ranked and compared. Through this analysis, the CIC dimensions were able to separate three predetermined types of landholders: full-time farmers, part-time farmers, and non-farmers. That finding suggested that the CIC could form the basis of a scale to assess farmer identity amongst rural landholders in both countries.

The interviews informed the creation of survey statements addressing the CIC dimensions that would be included in the postal survey. Subsequent analysis of survey data using summated scores based on 12 survey items incorporating six of the seven CIC dimensions established that the items based on the CIC formed a valid and reliable scale to measure a farmer occupational identity. This new measure, the Collective Occupational Identity Construct (COIC), was able to distinguish between three broad landholder cohorts (full-time farmer, part-time farmer, non-farmer), and additionally, provided a more nuanced approach to the challenge of landholder classification. These analyses therefore provided a positive response to research question one: it is possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s CIC.

The COIC scores for each survey respondent were then used in analyses to develop a typology of landholders based on the theoretically sound CIC. The 12-item COIC scale was used to undertake a cluster analysis to identify groups of landholders with similar farmer occupational identity. First a hierarchical technique was used to generate cluster solutions and establish the appropriate number of clusters followed by a non-hierarchical method (K-means algorithm) which formed the clusters by maximizing the separation of those clusters while minimising intra-cluster distances. The resulting typology has four landholder types (non-farmer, hobby-farmer, part-time farmer, full-time farmer). This analysis, therefore, addressed research question two in the positive: a farmer occupational identity scale based on the CIC can provide a theory-based typology of rural landholders.

Finally, general linear modelling of the survey data established that, as expected, there are relationships between a farmer identity and the adoption of land management practices. The expectation was that higher COIC scores (and higher levels of farmer identification) would be associated with land management behaviours with
production focus and lower COIC scores (and lower levels of farmer identification) would be associated with land management practices with a conservation focus. It was also expected that the inclusion of the COIC would improve modelling efforts aimed at predicting the land management behaviour of rural landholders.

An exploration of the relationship between COIC and land management practices identified the strength of the COIC in predicting landholder behaviour. COIC explained a statistically significant and unique variance in most models, which were agriculturally focused, biodiversity focused, or which included generic/commonly implemented land management practices. The results of these analyses suggests that the COIC item based on a farmer occupational identity is a unique feature that adds additional explanatory power to predicting landholder behaviour above-and-beyond what was possible through the use of Value-Belief-Norm items that are typically employed by social researchers attempting to explain landholder behaviour.

This research highlights that a valid and reliable scale can be created using the CIC dimensions with a focus on a farmer occupational identity. An interesting finding is that a farmer occupational identity can distinguish different types of landholders using items that are theoretically sound and generally not employed in the classification of rural landholders. The use of six of the seven CIC dimensions in the formation of COIC, and subsequently in the creation of a landholder typology, indicated the strength of a set of items that are not highly reliant upon contextually dependent variables (e.g. land use). Cluster analysis resulted in the creation of four clusters of rural landholders with distinctive characteristics, suggesting the approach can provide researchers with a theoretically sound construct and practitioners with a useful tool as they attempt to better understand and engage rural landholders in sustainable agriculture.

The clusters separate landholders into distinctive groupings that have sufficient internal homogeneity to allow NRM practitioners to tailor their approaches to engagement specifically to the characteristics of each category. An important point is that the profiles of each cluster include information about the key influences on rural landholder behaviour, including measures of values, beliefs, personal norms, trust and attitudes; as well as information about the “levers” that NRM practitioners can employ, such as the platforms (e.g. local organisations) and processes (trials, short
courses) that engage and build human and social capital. Tailoring approaches of regional natural resource management programs to appeal to rural landholders of varying farmer identities will provide practitioners with information to effectively, and economically, engage rural landholders.
CHAPTER 1 - INTRODUCTION

Rationale

In Australia and the United States rural areas are increasingly multifunctional, in that the character of many areas is being shaped by a mix of production, consumption and conservation values (Abrams & Bliss, 2012; Holmes, 2006). Agriculture may remain the dominant land use, but primary production is not the principal focus of all landholders. There is evidence that landholders who make their living from the land adopt different natural resource management (NRM) practices from those who are part-time farmers or non-farmers (Gosnell et al., 2007; Mendham & Curtis, 2010). As the non-farmer cohort of rural landholder’s increases, it is expected that occupational identity will be an increasingly important factor affecting agriculture and NRM (Gosnell, et al., 2007; Mendham et al., 2012).

In Australia, areas with attractive natural and cultural assets and areas close to metropolitan regions have experienced population growth and an influx of amenity-focused landholders (Buxton et al., 2006; Haberkorn et al., 2004). Similarly, in the American West large areas of agricultural and forested land are now occupied by amenity-oriented owners (Abrams & Bliss, 2012; Gosnell et al., 2006; Yung & Belsky, 2007). Advances in transport and communications, increasing levels of transferable incomes and a large cohort of wealthy individuals approaching retirement age are some of the factors driving amenity migration. It seems that many of these new owners have different motivations from ‘traditional’ owners and that an important difference is related to a production or consumption orientation (Bohnet, 2008; Mendham, et al., 2012; Sorice et al., 2012). That is, the new owners are more likely to engage in practices related to recreation, aesthetics and conservation, while longer-term owners are more likely to engage in production-related activities such as the use of minimum tillage to improve soil health or express concerns about and take steps to improve the economic viability of their operations (Gosnell, et al., 2007; Gosnell, et al., 2006; Mendham, et al., 2012).

The increasing diversity of rural landholders presents a challenge for researchers seeking to interpret the contemporary structure of the countryside and its future trajectory in developed economies. The multifunctional rural transition appeals as a
useful heuristic for those addressing this challenge and that conceptualisation has
underpinned this research. Despite the widespread acceptance of the increasing role
of non-farmer rural landholders, social researchers have not drawn upon the large
body of literature related to occupational identity to better understand the influence
of identity on management decisions. As Ikutegbe et al. (2014) illustrated, most
existing landholder classifications are based on proxy measures rather than direct
measures of occupational identity. Those proxy measures typically include economic
(property profit or income), social (group affiliation) and/or environmental attributes
(land management practices such as fencing waterways) (Jongeneel et al., 2008;
Sorice, et al., 2012). While the use of multifunctionality to conceptualise contemporary
rural landscapes has focused attention on the increased extent and impact of non-
farmers, that research and the work of those attempting to develop rural landholder
typologies has largely occurred without reference to identity theory. Using a variety of
frameworks to classify and compare the range of rural landholders is also problematic
for researchers in that it is difficult to compare findings from different studies.

This research addresses those knowledge gaps by exploring the nature and outcomes
of a farmer occupational collective identity. To accomplish this task the widely
accepted (in psychology; more than 400 citations) Collective Identity Construct (CIC), a
multidimensional socio-psychological measure, is utilised. The CIC (Ashmore, et al.,
2004) is a foundational model for conceptualising the elements included in theories of
identity. The CIC contains seven dimensions of collective identity. The seven
dimensions highlight elements that indicate the relative strength of an individual’s
collective identity. A collective identity is a statement of categorical membership that
is ‘shared with a group of others who have (or are believed to have) some
characteristic(s) in common’ (Ashmore, et al., 2004, p. 81). The CIC incorporates three
theories and one model (all relating to identity formation) to form a multi-dimensional
construct. Collective identity theory employs aspects of social identity theory, which
analyses the behaviour of individuals in group settings and how this relates to their
self-concept as a group member (Stets & Burke, 2000), and identity theory, which
postulates that a person’s identity can influence their attitude and that these identities
can influence behaviour (Stets, 2006; Stryker & Serpe, 1982). An occupational identity
is one in which its “members’ sense of identity is closely tied to their occupation”
Occupational identities are just one of many collective identities that individuals hold.

In this research, the CIC is used to develop a valid and reliable measure of a farmer occupational collective identity. This seven dimensional construct (five dimensions have separate sub-elements) has not been used in the natural resource context before. A refined construct, labelled the Collective Occupational Identity Construct (COIC) is the outcome of qualitative research in Australia and the USA (see below). The COIC is subsequently included in a survey of rural landholders in an Australian region, to examine whether the COIC could be used to classify rural landholders and to explore relationships between the COIC and landholders’ management behaviours (see below).

Research aims

To explore the role of farmer identity in multifunctional landscapes, three key research questions were addressed:

Research question 1 – Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?

A. Can the CIC distinguish between farmers, part-time farmers with larger rural properties and non-farmers with small/lifestyle properties?
B. Is the CIC able to distinguish rural landholders in different contexts (i.e. different countries)?
C. Do the seven dimensions of CIC form a valid and reliable scale to measure a farmer occupational identity (OI) amongst rural landholders? Are some dimensions of CIC better predictors of a farmer OI amongst rural landholders?

Research question 2 - Can a farmer occupational identity scale based on the CIC provide a valid and reliable theory-based typology of rural landholders?

Research question 3 - What is the nature of the relationship between farmer identity and the land management of rural landholders?
Methodology, methods and analysis

This research adopts a pragmatic, mixed methods approach with the research questions considered to be the most important aspect guiding development of the research process. The theoretical underpinnings of interpretivism and positivism frameworks are also drawn upon; however, the ontological, epistemological and methodological stances remain heavily influenced by the pragmatic framework. The specific definitions or conceptual areas addressed by such terms can be confusing as many research texts interchange labels as well as definitions of these terms (Glesne, 2011). For the purpose of this thesis, ontology refers to ‘the nature of reality’; epistemology as ‘the relationship between the researcher and the researched’; methodology as ‘the process of research’; and methods as ‘the technique used to gather and analyse’ those data (Creswell & Plano Clark, 2007).

Pragmatism is a ‘theory of truth’ that is reliant upon experience and interactions in society that lead to consequences and meanings (Denzin & Lincoln, 2013). It is through interpretation that meaning is assigned and ‘truth’ is achieved. In pragmatism, the research question takes precedence over the method or the philosophical worldview (Creswell & Plano Clark, 2007). Instead of focusing on the methods, “researchers emphasise the research problem and use all approaches available to understand the problem” (Creswell, 2009, p. 10). Morgan (2007) states, “the pragmatic approach ... rejects the need to choose between a pair of extremes [context and generality] where research results are either completely specific to a particular context or an instance of some more generalized set of principles” (p. 72). Pragmatism has epistemological and methodological flexibility and advocates for the use of mixed methods to address research inquiries (Creswell & Plano Clark, 2007; Tashakkori & Teddlie, 2010). Pragmatism allows for fluidity in the research stance and research process crossing and incorporating the boundaries of interpretivism and postpositivism, and was heavily relied upon in this investigation.

Pragmatic researchers tend to view research as a holistic endeavour and are inclined to discount the potential dichotomy of qualitative or quantitative research (Onwuegbuzie & Leech, 2005). A mixed methods approach is thought to allow for a greater collective understanding of a topic of interest. According to Babbie (1990),
social researchers “who limit themselves to a single method, survey or other, severely limit their ability to understand the world around them” (p. 27). By combining qualitative (e.g. semi-structured interviews) and quantitative (e.g. postal surveys) research methods, a researcher is able to benefit from the strengths of each approach and offset some of the limitations of both approaches.

A mixed methods approach was utilised and both qualitative and quantitative data collection was undertaken for this project. Semi-structured interviews with rural landholders provided the qualitative data; and a postal survey gathered the quantitative data for a large natural resource management region in Australia that included the smaller qualitative case study region in that country. Data gathered during the semi-structured interviews addressed research question one, ‘Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?’

To assess the extent that the CIC could distinguish rural landholders in different contexts, a region was selected in Australia and another in the USA. The first research site was in north east Ohio, USA [see Map 1], the second in north central Victoria, Australia [see Map 2]. Both areas were identified because they contained a mix of landholders with a variety of occupations. Agriculture is an important industry in both regions, but landholders living in those regions are in close commuting distance to major regional centres (with possible off-property work) and other industries are important, such as tourism in the Australian region. Forty interviews were conducted over the summer of 2013 in the USA (20 interviews) and summer 2014 in Australia (20 interviews). A mix of full-time farmers, part-time farmers and non-farmers were purposively selected. Interviewees were identified in the first instance through discussions with key informants in each region and subsequently by asking interviewees to identify other potential interviewees. Using a semi-structured interview format, I explored three broad topics with each interviewee: the CIC dimensions addressing facets of their identity and the connection to farming (for example, asking informants what they do for a living addresses the dimension of self-categorisation); their previous and current occupations; and their background information, including length of time living on the property, age, property size.
Map 1 Ohio, United States study site

Map 2 Victoria, Australia study site
The interviews were exploratory in nature as the CIC had not been used in a natural resource context before. The resulting qualitative data were interrogated to establish if there was a connection between a farmer identity based on the CIC dimensions and the three landholder types. To begin with, each informant was identified as one of the three landholder types on the basis of primary occupation and income, and level of production focus. Each interview was recorded and transcribed verbatim. Those transcripts were then deductively coded for major themes (i.e. CIC dimensions) [Table 1]. Analysis of the interview data focused on testing the extent the CIC provided a consistent separation between the informants who had been placed in each of the three landholder cohorts. I compared the coded text provided by each interviewee with the text provided by the other landholder cohorts (i.e. the interviewees I had predetermined would be full-time farmer, part-time farmer, non-farmer) to assess the extent a consistent pattern emerged within each CIC element. For each dimension and element, each informant was ranked on the relevance of that CIC dimension (and elements) to them. A rank of 1 to 11\(^1\) was used so that each interviewee could be assigned a score (1 being no relevance, 11 being highly relevant) (see notes below). The rankings for each interviewee were plotted on a graph for each CIC dimension.

Based on the visual representation of the data points within the CIC dimension graphs, I rated the usefulness (‘very useful’, ‘useful’, ‘little use’, ‘no use/unhelpful’) of each CIC dimension to distinguish between the three landholder types to answer part of research question one. A separate category of ‘potential use’ was also included to identify instances where there was a mix of assessments for a dimension across the three landholder types. This process was repeated to cover the observed relationships between each pairing of the landholder types (i.e. full-time farmer/part-time farmer, part-time farmer/non-farmer, non-farmer/full-time farmer).

I was able to include the refined CIC (the COIC scale) in a 16-page survey mailed to a total of 1,939 of rural landholders owning 10 hectares or more of rural land in the North Central Catchment Management Authority region [see Map 2]. Landholders were selected based on a random sample drawn from the complete list of landholders

\(^1\) A rank of 1 to 11 was used as 11 USA part-time farmers were initially interviewed; one was ultimately discarded. A rank of 11 was used so that each informant could be assigned a score.
owning more than 10 ha of land in the local government area databases. A total of 1,939 surveys were delivered with 794 returned surveys and 296 blanks, declines and/or return to senders. The survey response rate was 48.3%. In the one per household mail survey, the sampling of 1,939 residents included a variety of primary occupations. The mail survey was distributed at the beginning of May 2014 and was ‘closed’ mid August 2014.

The inclusion of quantitative data in this research was made possible through existing research efforts by social researchers at Charles Sturt University. The North Central CMA commissioned Professor Allan Curtis and his research team to implement a survey of rural landholders across the North Central CMA region to gather information that would enable the organization to more effectively engage rural landholders and to evaluate the impact of North Central CMA investment in NRM. The CSU team applied an approach developed by Professor Allan Curtis that gathers spatially-referenced data from landholders to address the specific needs of regional NRM practitioners.

The quantitative data gathered by the survey were analysed to address part of research question one (i.e. Do the seven dimensions of CIC form a valid and reliable scale to measure a farmer occupational identity (OI) amongst rural landholders?); and research questions two (i.e. Can a farmer occupational identity scale based on the CIC provide a valid and reliable theory-based typology of rural landholders?) and three (i.e. What is the nature of the relationship between farmer identity and the land management of rural landholders?). A summary of the additional statistical testing utilizing COIC in answering research questions two and three are presented in [Table 1].
Table 1 Overview of key research questions and approach to qualitative and quantitative data analysis

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Analysis</th>
<th>Analysis</th>
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<tbody>
<tr>
<td>1A. Can the CIC distinguish between farmers, part-time farmers with larger rural properties and non-farmers with small/lifestyle properties?</td>
<td>Separation of interviewees into farmers, part-time farmers &amp; non-farmers and comparing/contrasting the seven CIC dimensions</td>
<td>Kruskal-Wallis H Tests for differences between cohorts and self-selected descriptors to assess the extent the seven dimensions explain expected differences in farmer occupational identity of the three groups: full-time, part-time, non-farmers</td>
</tr>
<tr>
<td>1B. Is the CIC able to distinguish rural landholders in different contexts (i.e. different countries)?</td>
<td>The comparison of CIC applicability to landholders as found in the USA is compared to landholers in Australia</td>
<td>N/A</td>
</tr>
<tr>
<td>1C. Do the seven dimensions of CIC form a valid and reliable scale to measure a farmer occupational identity (OI) amongst rural landholders? Are some dimensions of CIC better predictors of a farmer OI amongst rural landholders?</td>
<td>Rating of appropriateness of each dimension to landholders as found in the interviews</td>
<td>Statistical tests for reliability and validity (e.g. Crohbach’s alpha and principal component analysis)</td>
</tr>
</tbody>
</table>
### Thesis outline

In the next chapter I provide a review of the literature [Chapter 2] in which existing research was examined to identify a theoretical foundation for a farmer occupational identity and identify the gaps in the literature. This information helped frame the key research questions.

Chapter 3 outlines the general research methodology. That is, I explain my ontology and epistemology, my choice of mixed methods, data collection approaches, and data analysis techniques.

Chapters 4, 5 and 6 comprise the findings and discussions of this research. In Chapter 4 I introduce the steps taken to test the validity and reliability of the CIC as a measure of a farmer occupational identity amongst rural landholders. This chapter explores the usefulness of each of the dimensions of the CIC and the extent each dimension can distinguish different types of landholders. In addition, this chapter contains

<table>
<thead>
<tr>
<th>2. Can a farmer OI scale based on the CIC be used to provide a valid and reliable theory-based typology of rural landholders?</th>
<th>Interview analysis provide support to the quantitative analysis and illustrate the utility of the CIC</th>
<th>Cluster analysis coupled with tests of reliability using the CIC scale (e.g. Cronbach’s alpha) explore the capacity of CIC to develop a theory-driven typology based upon the developed collective occupational identity construct (COIC) score</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. What is the nature of the relationship of the farmer component of personal identity and behaviour?</td>
<td>Interviewee quotes are used to support the findings in the quantitative analysis</td>
<td>Use of COIC scores and values, beliefs, norms, attitudes, information source, and experience to test for relationships between farmer components and behaviour using a general linear model</td>
</tr>
</tbody>
</table>
information comparing the CIC dimensions across the two study sites (key research question 1).

In Chapter 5 I present the results of analyses testing whether the COIC can provide a theory-based typology of rural landholders (key research question 2). Here I present a landholder typology and associated profiles of four types of rural landholders.

In Chapter 6 I examine the extent and nature of expected relationships between farmer identity and landholder behaviour (key research question 3). For example, higher COIC scores were expected to be associated with behaviours with a strong productive focus.

Chapter 7 is the conclusion where I recap the research rationale and summarise the key results and the contributions of my thesis. I also reflect on my research approach, the implications of my research for policy and management, and briefly identify opportunities for future research on this topic.

Comments on the structure and content

Two data chapters in this thesis (Chapters 4 and 5; three separate papers) were originally prepared as stand-alone manuscripts suitable for publication in scientific journals. For this reason the discussion is incorporated into each of the results chapters. These chapters were reformatted for a consistent style to integrate back into the thesis; the literature review sections of each of those papers has been omitted as that information is all contained in the literature review Chapter 4. However, because of the stand-alone format of each chapter, there will inevitably be some minor repetition among chapters. The results chapters contain a more specific and detailed methods section (not found in the general methods chapter 3). A single reference list is provided at the end of the thesis to avoid unnecessary duplication. I am personally responsible for all data analysis and the majority of written text. At the time of writing, one paper based on Chapter 4 is in press while a second paper for Chapter 4 has been published. A paper based on Chapter 5 is under review for publication.
CHAPTER 2 – A LITERATURE REVIEW

Introduction

In Australia and the United States rural areas are increasingly trending away from the traditional productivist countryside towards multifunctional landscapes, in that many regions are no longer dominated by agriculture and are shaped by a mix of production, consumption and conservation values (Abrams & Bliss, 2012; Holmes, 2006). In Australia, areas with attractive natural and cultural assets and areas close to metropolitan regions have experienced population growth and an influx of amenity-focused landholders (Buxton, et al., 2006; Haberkorn, et al., 2004). Similarly, in the American West large areas of agricultural and forested land are now occupied by amenity-oriented owners (Abrams & Bliss, 2012; Gosnell, et al., 2006; Yung & Belsky, 2007).

Some people moving to rural areas are purchasing land with amenity values (be it cultural or natural) for recreational purposes and/or to fulfil their conservation values. As a result, the occupations of rural landholders are becoming more varied. These landholders often have a different orientation than ‘traditional’ farming landholders particularly related to a production or consumption orientation (Bohnet, 2008; Mendham, et al., 2012; Sorice, et al., 2012). That is, the new owners are more likely to engage in practices related to recreation, aesthetics and conservation, while longer-term owners are more likely to engage in production-related activities such as improving irrigation efficiency and express concerns about maintaining the economic viability of their operations (Gosnell, et al., 2007; Gosnell, et al., 2006; Mendham, et al., 2012). This distinction is important as the majority of land in Australia (over 60%; Australian Bureau of Statistics, 2012a) and in the United States (70%) is privately owned which makes land stewardship/management by private landholders critical to the health of the environment (Warbach et al., 2012).

In some regions agriculture may remain the dominant land use, but primary production is not the principal focus of all landholders. The number of individuals farming full-time is on the decline and those farming part-time or not at all is on the rise (Mendham, et al., 2012; Wilson et al., 2003). Indeed, full-time farmers\(^2\) account

\(^2\) Based upon a stated primary occupation.
for less than 50% of principal operators in the United States in 2012 (United States Department of Agriculture, 2014) and rural regions in Australia (Curtis & Mendham, 2011). In Australia, the number of primary producers identifying as farmers declined 11% in the five years preceding 2011 (Australian Bureau of Statistics, 2012a). Farming however still accounted for fifty-three percent of land use (410 million hectares) in Australia in 2011 (Australian Bureau of Statistics, 2012b).

There is evidence that landholders who make their living from the land adopt different natural resource management (NRM) practices from those who are part-time farmers or non-farmers (Gosnell, et al., 2007; Mendham & Curtis, 2010). As the non-farmer cohort of rural landholders increases, it is expected that occupational identity (the degree to which an individual’s self-image is connected to an occupation) will be an increasingly important factor affecting NRM (Gosnell, et al., 2007; Mendham, et al., 2012).

A variety of approaches have been used to measure and classify this increasing diversity of rural landholders with limited utility. A myriad of items are often selected to separate landholders into similar categories (e.g. property size, asset holding, land use). A landholder’s occupational identity is one item receiving greater attention in the literature as a variable able to separate landholders without the reliance on items that fluctuate from one context (e.g. attitudinal variables; Seabrook, McAlpine, & Fensham, 2008) to another making direct comparison between landholders difficult. Most quantitative studies have simply asked respondents to self-declare their principal occupation or have drawn inferences from data perceived as related (e.g. size of farm, off-farm income) to explore the influence of occupational identity (Mendham & Curtis, 2010; Paquette & Domon, 2003). Other studies (e.g. Petzelka, et al., 2006) provide a 'somewhat indirect operationalisation' of occupational identity through the use of a summated index incorporating measures in which a resident may be involved in resource-based organisations and level of attachment to natural resources. This segmentation and the subsequent development of rural landholder typologies have largely been completed without reference to identity theory.

3 ABS defines a ‘farmer’ as an individual who reported their main occupation as farmer or farm manager.
Research in other contexts has resulted in the development of a theoretically derived measure of occupational identity known as the Collective Identity Construct (CIC) (Ashmore, et al., 2004). This construct appears to provide a solid foundation for researchers setting out to explore the nature and role of occupational identity in NRM. As Emtage et al. (2006) note, given the appeal of having a “comprehensive set of information with which to define and describe landholder types, a major challenge is to find a system or methodology that can be replicated between regions at a reasonable cost” (p. 90). Such a construct is currently lacking. The use of an occupational identity may be a comprehensive yet generic enough construct to fill this void.

The term ‘identity,’ like many terms in the social sciences, is not bound by a rigid set of rules nor does the term fit neatly into one particular box. Identity is as complex and unique as each individual person. Identity exists in all realms of life, describing our sexual identity to our occupational identity. An exhaustive discussion of all existing identities is impractical if not impossible. For the purpose of this thesis, the concepts of identity directly relating to a landholder occupational identity will be explored. Literature from the natural resources and occupational science/therapy fields will be drawn upon to explore the basis and intricacies of identity.

In this chapter, I first present an overview of the concept of collective identity and relevant identity theory. The CIC is then examined followed by a discussion on the relevance of an occupational community. I then provide a brief overview of contemporary approaches to the investigation of occupational identity in natural resource management (NRM).

**Collective identity overview**

There is little consensus on how to properly define the term identity as scholars argue that there is no single overarching definition to encapsulate the term appropriately (Clayton & Opotow, 2003; Lawler, 2008). Some scholars put forth the argument as to whether the realm of identity is primarily single or multiple; independent or interdependent; and even personal or social (Ashmore, et al., 2004). Vaughan and Hogg (2008) define identity as “cognitive constructs that influence social interaction and perception and are themselves influenced by society” (p. 112). Similarly, Laliberte-
Rudman (2002) define identity as “how people view themselves and are viewed by others” (p. 12). Clayton (2003) perhaps described identity the best with a broad description as seeing identities as “a way or organizing information about the self” (p. 45).

Each individual has multiple (Cooley, 1902), layered, complex and continually changing identities based on the social networks and positions each person occupies in a particular setting, all of which is influenced by the particular social context (Burke & Stets, 2009; Clayton & Opotow, 2003; Lawler, 2008; McGuire et al., 2013; Nunkoo & Gursoy, 2012). An identity is constructed by more specific identities also known as sub-identities such as sex, ethnicity, and occupation among others (Proshansky, 1978). Identity involves identification with something whether it is a broad category like ‘American’ or a specific category as a member of a certain family. By identifying with one category we are also excluding ourselves from other categories (i.e., if I identify as being female then I also exclude myself from the category of being male). Each identity reflects the position held in a social structure and sets the standards for appropriate or expected behaviour within a particular setting (McGuire, et al., 2013; Stets & Burke, 2000). Identity is continually influenced and reshaped within a person and by our interactions with society.

Occupational identities are just one of many collective identities that individuals hold (Burke & Stets, 2009). A collective identity is a statement of categorical membership that is “shared with a group of others who have (or are believed to have) some characteristic(s) in common” (Ashmore et al., 2004, p. 81). Taylor and Whittier (1992) define collective identity as “the shared definition of a group that derives from members’ common interests, experiences and solidarity” (p. 105). Collective identity can be thought of as a bridge between social identity theory and identity theory with some added elements for distinction. The different roles and positions that a person occupies comprises a personal identity, which as Klandermans et al. (2002) state, is always shared with others (i.e., farmer, banker, mother) and transforms into a general collective identity. Collective identity acknowledges the person variables (as in identity theory), while also recognizing the social aspects (as in social identity theory) that prevail in the multidimensional context that is collective identity. Ashmore, et al. (2004) describe collective identity as a “set of individual-level elements, facets, or
dimensions” and acknowledge that “inconsistent terminology, strategies of management, variability, and the course of identity development” plagues this theoretical concept (p. 81). Brewer and Gardner (1996) concede that “changes in levels of self-categorisation reflect not only differences in views of the self but also different worldviews” (p. 91). Collective identity is inherently social by nature in that all aspects of the self are influenced by social interaction (Simon, 1997).

As found in Brewer and Gardner (1996), “individuals seek to define themselves in terms of their immersion in relationships with others and with larger collectives and derive much of their self-evaluation from such social identities” (p. 83). Klandermans, et al. (2002) address four components of collective identity: cognitive, evaluative, affective and behavioural. The authors placed the process of categorisation into the cognitive component, the assessment of a group’s position in relation to other groups into the evaluative component, the degree of attachment between an individual and a group into the affective component, and, lastly, the participation in identity organisations into the behavioural component. Regarding the behavioural component, Andrews (1991) made the distinction between involuntary (age, race, gender, etc.) and voluntary (women’s group, labour unions, etc.) group memberships concerning political involvement and social identity. This distinction among the behavioural component is important as the voluntary aspect was incorporated into the collective identity construct.

**Foundational footing of the collective identity construct (CIC)**

Identity literature has drawn on a host of theoretical underpinnings. In this section I only discuss the most prominent, including symbolic interactionism, identity theory, social identity theory, self-categorisation theory and the nigrescence model. Symbolic interactionism is an important tool to understand meanings and interactions. While Ashmore, et al. (2004) did not place a direct emphasis on symbolic interactionism, identity theory, one of the four major concepts included in the CIC, is derived from the symbolic interactionist orientation. The identity theory, social identity theory, self-categorisation theory and the nigrescence model contribute to the CIC development and ultimate contribution to the collective occupational identity literature. Identity is often linked with self-concept and is conceptualised into two broad classes: personal
and social identity each of which will be further described in turn (Clayton & Opotow, 2003; Laliberte-Rudman, 2002; Tajfel & Turner, 1979).

Symbolic Interactionism

Coined by Herbert Blumer in 1937, symbolic interactionism is a theoretical perspective in which society is viewed as composed of symbols that people use to establish meaning, negotiate different social situations while developing their views of the world, and communicate with one another (Henslin, 2004; Swingewood, 2000). We evaluate our own behaviour by comparing ourselves to others. Symbols set the stage for our everyday life. Symbols allow us to define who we are and our relationships to one another. Our behaviours are dependent on how we define ourselves, how we define others and the relationships that exist.

Symbolic interactionism takes an inductive approach of social organisation. The focus is on the creation/development of an individuals’ identity as a product of social interaction (through language and gesture) and the importance of shared meanings (Carroll & Lee, 1990; Vaughan & Hogg, 2008). George Herbert Mead studied the importance of an individuals’ ability to ‘take the role of the other,’ allowing individuals to imagine how others feel and how they might behave. Mead believed that most interactions revolved around "reaching a common understanding through language and other symbolic systems" (i.e. symbolic interactionism) (Babbie, 2011, p. 37).

Stryker (1980) claims that because there are many interpretations and points of view by notable scholars in the fields of psychology and sociology, “there is no single symbolic interactionism,” but different versions of the same idea (p. 136). Similarly, Burke and Stets (2009) acknowledge that differences exist but state that there are two forms of symbolic interactionism. The first is a traditional symbolic interactionism where the guiding principle is that things are in flux and constantly changing. The second form is structural symbolic interactionism. 'Structural symbolic interactionism' was coined by Stryker in his book entitled 'Symbolic interactionism: A social structural version' published in 1980. Structural symbolic interactionism refers to a "set of ideas about the nature of the individual and the relationships between the individual and society" (Burke & Stets, 2009, p. 9). Contrasting with the traditional guiding principle, structural symbolic interaction infers that there is a semblance of consistency to
society. Essentially, the focus is on “describing and understanding rather than explaining and predicting” (Burke & Stets, 2009, p. 36). The majority of structural symbolic interactionists believe that there is enough consistency in life to warrant the development of theoretically sound generalisations. While there is change in structural symbolic interaction, there is enough consistency to gather reliable, valid data and further develop theory.

**Personal identity**

Personal identity, as Laliberte-Rudman (2002) and Tajfel and Turner (1979) claim is one of two broad classifications of identity (the other our social identity). This classification helps form identity (Lawler, 2008) and “defines self in terms of idiosyncratic personal relationships and traits” (Vaughan & Hogg, 2008, p. 123). Stets (2006) uses the term person identity and defined this term as comprised of “the set of meanings that are tied to and sustain the individual (p. 90). These person identities tend to be relevant across social roles, which reflect each individual’s particular traits and qualities. McGuire, et al. (2013) highlight how a person identity can be thought of as a ‘master identity’ as a personal identity is often considered the “organizer and modifier” of individuals roles and social identities. Stets and Burke (2003) add that like most identities an individual identity is maintained by reflected appraisals from others and if necessary adjusts their individual behaviour or their identity standards.

Laliberte-Rudman (2002), in focusing on the realm of onset disabilities, refers to personal identity as the “arrangement of self-perceptions and self-evaluations that are meaningful to a person” (p. 12). The determination of these studies maintained that “an acceptable self-identity was often linked to maintaining a sense of continuity of identity; that is, to maintaining a sense that one was, in many ways, the same person that he or she had been earlier in life or prior to the onset of disability” (p. 15). This in many ways is similar to those in the logging industry who stressed that working in that particular industry was their only option for employment and that they could not think of doing anything else. The tie that existed between the loggers and their identity was very much present. Christiansen (1999) views occupation as “the principal means through which people develop and express their personal identities,” and that a personal identity incorporates everything about the person we think we are (p. 547)
which is the reason why some individuals feel so tied and connected to their occupation.

**Identity Theory**

Identity theory postulates that a person’s identity can influence their attitude, and these identities can have a direct bearing on behaviour even if it does not influence one’s attitudes (Mannetti et al., 2004; McGuire, et al., 2013; Nunkoo & Gursoy, 2012). Identity theory grows out of the symbolic interaction perspective that society influences social behaviour through its manipulation on self (Hogg et al., 1995). However, as Stryker and Serpe (1982) state, identity theory “rejects the symbolic interactionist view of society as a ‘relatively undifferentiated, co-operative whole” (p. 256). Identity theory has two slightly different emphases as recorded in Stets (2006): the influence of social structure on an individuals’ identity and behaviour, and the emphasis of internal dynamics that influence behaviour.

An identity is “the set of meanings that define who one is when one is an occupant of a particular role in society, a member of a particular group, or claims particular characteristics that identify him or her as a unique person" (Burke & Stets, 2009, p. 3). When people see themselves as a mother, student, farmer (i.e. roles), a member of a political party (i.e. member of a particular group), or see themselves as loyal or trustworthy (i.e., characteristics), they attach meanings to what it means to embody each of these classifications. These meanings are individual, yet are shared by the larger society. People have multiple identities depending on the roles, memberships and characteristics they claim. Identity theory “seeks to explain the specific meanings that individuals have for the multiple identities they claim; how these identities relate to one another for any one person; how their identities influence their behaviour, thoughts, and feelings or emotions; and how their identities tie them in to society at large" (Burke & Stets, 2009, p. 3). Society and individuals are reliant upon each other to define our existence.

**Components of identity in Identity Theory**

Burke and Stets (2009) visualise an identity consisting of four main parts: input, identity standard, comparator and output. Each is a process relating to meanings in
the environment and in the self. All are arranged in a cyclical hierarchical arrangement and dependent on each other [Figure 1]. Burke and Stets (2009) highlight that they "operate in a homeostatic and conservative fashion to maintain perceived self-meanings within a certain range..." (p. 62). Like a thermostat controls the heating in a house, the four components are organized into a 'control system', which functions to 'control the input to the system'.

![Diagram](image_url)

**Figure 1 Model for two hierarchically arranged identities within a person (Burke & Stets, 2009)**

The components of an identity are described as follows:

1. **Identity standard** - The identity standard is the set of meanings contained in each single identity, which defines the character of that identity. Meaning is contained in the identity standard, and regardless if meanings are singular or plural, all relevant meanings can be thought of as a set which could include "denotative and connotative
meanings, emotional meanings and meanings not yet measured" (Burke & Stets, 2009, p. 64).

2. **Inputs** - Inputs are the perceptions that are central to the identity process. Our perceptions are what we aim to control. These tell us what is happening around us in the environment - our only source of information. We may think that we try to control things - holding a baby, planting a field, etc., but it is our thoughts which convince us when we have done so - we can see, hear and feel them. Within the identity model, "perceptions are compared with the identity standard with the goal of matching the perception to the standard" (Burke & Stets, 2009, p. 65). When the two match, we have met our goal. The standard is the goal for the perceptions. Perceptions are the continuous inputs to identity in the comparator - the relevant meanings in any given situation. These perceptions are compared to the identity standard.

3. **Comparator** - In the comparator, a comparison is made between the input perceptions of meanings relevant to the identity with the memory of meanings of the identity standard. An 'error signal' is produced if the input and the standard do not match. The error signal ultimately affects the patterns and sequences of verbal and nonverbal behaviour, which alters the meanings of the behaviour in a situation to bring it back in line with the identity standard.

4. **Outputs** - The outputs in this model reference the behaviour in the situation - based on the error signal from the comparator. The error signal "indicates the magnitude and direction of the difference between the input perceptions and the identity standard along some dimension of meaning" (Burke & Stets, 2009, p. 66). Output (meaningful behaviour) is produced in the environment. Output behaviour attempts to alter the 'symbolic character' of the environment which changes symbols and perceptions, and alters meanings. According to the model, the actual behaviours are irrelevant, the meaning or symbolic value is what is the key.

Identity verification is the process by to change meanings to bring them into alignment with the meanings held in the identity standard (Burke & Stets, 2009). Identity theory assumes that identity meanings are always changing. In this model the ‘big picture’ is higher (in a hierarchy) than its parts. Identities at the higher level are more general
than at the lower level. For instance, a landholder may see that land along the stream is eroding. This observation would occur on a lower level than determining that the erosion is happening because of lack of vegetation, flooding and improper fencing of livestock crossing areas.

Burke and Stets (2009) explain that the “hierarchical nature of the identity control system (HNICS) was what made change both possible and inevitable” (p. 176). The HNICS, in fact, explains both the stability of our social and personal identities over time and the changes that can and do occur. The identity standard, which includes the identity meanings and expectations, is altered. Burke and Stets (2009) state that many symbolic interactionists argue that identities have fluidity and are changing, with some even arguing that identities are constructed anew in every situation we encounter (Blumer, 1969). However, it is unlikely that we are able to see day-to-day changes in a person; we instead see gradual changes that occur over a long length of time.

Identities, in the course of the verification process, resist change. Identities act to change the situation in order to bring situational relevant meanings into alignment with the meanings in the identity, thus verifying and supporting the existing self-meaning. This resistance to change causes a level of stability. However, an individuals’ ability to resist change is not the same as sustaining no change; the meanings in identity standards do change. In general, however, the meanings change very slowly. There are some exceptions to this rule however (e.g. brainwashing or epiphany).

**Change in identity**

There are three general conditions under which an identity may change (Burke and Stets, 2009). The first condition is a change in the situation that alters the meanings of the self in a situation that is out of congruence with the identity standard. A second condition occurs when conflict between two or more identities are held by an individual. Lastly, the third condition manifests when conflict occurs between the meanings of an individual's behaviour and the meanings in their identity standard. All three of the above conditions involve an incongruence between perceptions and lower-level identity standard. This incongruence leads to a modification in the higher-level identity output in order bring the perceptions back into alignment with the higher-level standards (Burke and Stets, 2009).
Barr (2002) identified a large body of factors that have, and will continue to, influence the changing rural landscapes - most of which can extend to a change in identity. Some of the factors include population decline of those in younger age cohorts, urbanization, aging baby boomers, culture change, changes in social values, increasing participation in off-farm work, and an increase in demand for amenity landscapes. The trend for farmers to see themselves less as a labourer and more strategic, or that of a manager, will lead more and more farmers to construe their farming activity as a way to achieve a profitable business and market opportunity. Work conducted by Kuehne et al. (2008) suggests that irrigators are moving away from an identity of providers to more of an investor or lifestyler identity. An awareness of descriptors of identity is necessary to capture the appropriate landholders. For example, the emphasis on 'farmers' in any given region could potentially omit the smaller acreage landholders who own pervasive land degradation areas near rivers and streams.

**Social Identity**

Social identity as defined by Vaughan and Hogg (2008) is explained in terms of group memberships and helps to form our overall identity (Lawler, 2008). Laliberte-Rudman (2002) loosely defined social identity in terms of how a person is viewed by others. Social identity reflects how "...people categorise themselves as similar to some, labelled the in-group, and different from others, the out-group" (Stets, 2006, p. 89); this allows individuals to feel as if they are part of something bigger (McGuire et al., 2013). An in-group serves as a reference for proper behaviour, and individuals adopt the prevalent group attitudes and beliefs as their own (Wood, 2000). A social identity can be a broad or a narrow category; being American or Australian or categorizing yourself as a member of the Smith family, all include taking on the identity of something abstract and melding that into who you are as a person. Individuals who plant crops or raise stock may categorize themselves as farmers for instance, and while that is a broad category, they may also classify themselves as farmers within a particular watershed. Each watershed may have particular views that each group member will take on as a part of their own identity.
From a social identity perspective, “when the salient basis for self-conception is a specific social identity, an individual’s behaviour will become group-based and guided by the norms of that social category or group” (Fielding, McDonald, et al., 2008a, p.319); this highlights that the individual will accentuate the similarities between the self and other in-group members and highlight the difference between all others. The behaviour and expectations of the in-group will guide the behaviour of the individual. In order for an individual to see themselves as a member of an in-group they must also discriminate in some way with those belonging to an out-group (Tajfel, 1974). One of the most durable and important problems that an individual is faced by inserting themselves into society is to “find, create and define his place in these networks” (Tajfel, 1974, p. 67). Social identity is therefore a part of an individuals’ self-concept which is shaped from the knowledge and emotional significance attached to membership of a social group (or groups) (Tajfel, 1974).

**Social Identity Theory**

Social identity theory (SIT), another core theory of CIC, is a ‘mid-range’ social psychological theory that analyses the behaviour of individuals in group settings and how this relates to their self-conception as a group member (Vaughan & Hogg, 2008). The focus of SIT is group situations (Stets & Burke, 2000) with an aim to explain intergroup relations (Brown, 2000). Traditionally, SIT has given little attention to individual variation and instead has focused on conditions of identity salience (Ethier & Deaux, 1994). Within SIT, social identity is said to be derived from group memberships and that individuals strive for a positive social identity, which is derived largely from favourable comparisons made between the in-group and relevant out-group (Brown, 2000). An ‘unsatisfactory’ identity leads individuals to want to leave the social group or find ways of attaining more positive uniqueness from the tie to that group (Tajfel, 1982). Brown (2000) noted that one weakness of this theory is that it lacks specificity when predicting the adoption of identity strategies in particular situations. Tajfel (1974) argues that SIT has been “too one-sided”...and that an “adequate social psychological theory of intergroup behaviour must take into account both casual directions: from in-group processes to out-group behaviour and attitudes as well as the opposite one which has been until now the principal object of theory and research” (p. 67). Tajfel (1974) states that in-group and out-group behaviours are, to
some extent, determined by the ongoing process of self-definition. Identifying as a member of a group “provides participants with an instant and meaningful collective identity that is experienced as emotionally significant” (Ashmore et al., 2004, p. 84).

Social identity theory, as a whole, fails to consider the existence of multiple group memberships within any one individual at any given time. Tajfel does acknowledge that people belong to more than one social group, but does not "address the complex psychological dynamics that such multiple group membership involves" (Andrews, 1991, p. 26).

**Self-Categorisation Theory**

Self-Categorisation Theory (SCT) is viewed as an extension of social identity theory that describes a “relationship between self-concept and group behaviour that details the social cognitive processes that generate social identity effects” (Hogg & Terry, 2000, p. 123). Hogg and Terry (2000) see no incompatibility issues between SIT and SCT, but view the latter as an influential conceptual component of SIT. Like SIT, SCT posits that an “increase in salience will lead to an increase in identification” (Ethier & Deaux, 1994, p. 249). SCT “specifies the operation of the social categorisation process as the cognitive basis of group behaviour” while accentuating the perceived likeness to the relevant in-group or out-group (Hogg & Terry, 2000, p. 123). Klandermans, et al. (2002) add that “depending on contextual circumstances, an individual may act as a unique person (displaying personal identity) or as a member of a specific group (displaying one of many collective identities)” (p. 237). Individuals have an ingrained cognitive tendency to separate social stimuli (individuals) into groups based on levels of perceived similarity or distinctiveness from other individuals present (Ashmore et al., 2004). SCT proposes the more an individual is able to identity with a given social category, that individual is more prepared to use the category in question in their self-definition (Ashmore et al., 2004) and are more prepared to act as a group member (Klandermans et al., 2002).

**Nigrescence Model**

The final component of the CIC is the model of nigrescence. This model, as proposed by Cross (1991) (a.k.a Cross Racial Identity Scale (CRIS)), has been one of the most
influential formal stage theories of collective identity. Stage theories account for how collective identification develops and changes over time (Ashmore et al., 2004). The nigrescence model explored the developmental stages of black racial identity in five stages [Table 2]. ‘Pre-encounter’ is the first stage which is characterized by very low explicit importance and which the person does not see their ethnic background as a significant element of their self-concept. Stage two involves ‘encounter’ situations occur which highlight an individuals’ race and what this means for personal identity. In this phase race becomes salient and explicit importance is heightened. ‘Immersion-emersion’, or stage three, involves going beyond thinking about your ethnicity to “acting Black” and making visible the racial group affiliation. This stage is characterised by a very favourable view or high private regard and low public regard; other black individuals would be viewed in a favourable light while others of a different race would be viewed unfavourably. Stage three is also characterised by high levels of the three CIC dimensions of social embeddedness, behavioural involvement, explicit importance.

The immersion-emersion label is highlighted by the highly involved thought, feeling and behavioural actions associated with being a certain race and identifying self in that way. Stage four is characterised by a greater level of comfort with one’s group membership and is labelled ‘internalization’. When an individual reaches stage five, ‘internalization-commitment’, racial identity is “used as a consistent guide to action, and not just behaviour to show that one is Black” (Ashmore et al., 2004, p. 107).

**Table 2 Cross’s (1991) Racial Identity Scale**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre-encounter</td>
<td>Race is not seen as a significant component of self</td>
</tr>
<tr>
<td>2. Encounter</td>
<td>Events lead to conscious acknowledgement of race and in personal identity</td>
</tr>
<tr>
<td>3. Immersion – emersion</td>
<td>“Acting Black” and displaying racial group membership</td>
</tr>
<tr>
<td>4. Internalization</td>
<td>Increased comfort level with one’s group membership</td>
</tr>
<tr>
<td>5. Internalization – commitment</td>
<td>Racial identity is used to guide behaviour/action to show that one is Black</td>
</tr>
</tbody>
</table>
Identity overview

Burke and Stets (2009) identify the bases of identities: roles, social and person identities. Roles are based on different social structural positions (farmer, pensioner, banker, etc). Social identities are based on individuals' memberships in certain groups (Land Conservation, Democrat, Catholic, etc). Lastly, person identities are based on a view of the person as a unique entity, distinct from other individuals. The focus is on the qualities or characteristics individuals internalise as their own (controlling, ethical, etc). Person identities are underdeveloped in comparison to all the work completed on roles and social identities. A role is a "set of expectations tied to the social position that guide people’s attitudes and behaviour" (Burke & Stets, 2009, p. 114). Role identity is shaped by culture and each person’s distinctive interpretation of the role (Burke & Stets, 2009, p. 114). Finally, social identities imply an in-group and an out-group - 'us' vs. 'them' mentality.

Clayton and Opotow (2003) suggest that identity describes our social roles, which as Fielding, et al. (2008b) claim motivate role appropriate behaviour and keep internal conflict between identity and actions in check. For example, farmers who were identified as no longer belonging to the ‘good farmer’ identity by members of the public, changed their actions so that they once again were perceived by others to fit into this category (McGuire, et al., 2013). In most cases the more important and salient an identity is, the greater the probability of role-consistent action. In research conducted on the logging industry (Carroll, 1995; Carroll & Lee, 1990), those individuals who identified as a logger were more prone to adopt and proclaim the beliefs held by the majority of loggers even if they didn’t know why (i.e., “I’m a logger so I’m supposed to hate the Forest Service...” (Carroll & Lee, 1990, p. 147).

Carroll completed approximately 750 hours of active participation in a logging community eventually securing a job on one of the logging crews (Carroll and Lee, 1990). It was through this intensive participation (and participant observation) with this occupational community that informed his second phase of 'analytic induction' (i.e., in-depth interviews with members of the community) ultimately leading to Carroll developing a model based on the empirical evidence. The work by Carroll and colleagues illustrates the importance of a logger identity, the shared meanings, and
how these facets affect loggers in a waning logging industry where employment in the logging industry was becoming more difficult to obtain and hold.

Identifying with a particular group allows one to know what to think and what to do, while being able to identify other individuals allows one to make predictions on what they think (Vaughan & Hogg, 2008). Those in the logging industry that were still considered novices connected less with the identity of ‘logger’ and were less prone to view important ‘logging issues’ in the same light as those loggers who had been in the industry for years. The interrelationships with others and the interpretations of what we do in those interactions, influences our behaviour to performing role consistent behaviour (Nunkoo & Gursoy, 2012; Unruh, 2004).

**Self, self-concept and self-esteem**

The word *self* is used every day to express direct thoughts, feelings and sensations. This, however, “begins with the awareness of our body and is augmented by our sense of being able to make choices and initiate action,” while also encompassing “the abstract and complex ideas that embellish the self” (Christiansen, 1999, p. 548). The self “originates in the mind of persons and is that which characterises an individuals' consciousness of his or her own being or identity” (Burke & Stets, 2009, p. 9). Allan (2011) and Stryker (1980) remark on Mead’s interpretation of the self as reflexive in that you have the ability to evaluate yourself as you do others and the self allows an individual to give meaning to actions. This reflexivity is the core of the self where the self can be both object (‘me’) and subject (‘I’). The self is an active, organized set of processes within us that through language – “a system of significant symbols” - allows for this reflexivity (Stryker, 1980, p. 37). Reflexivity is central to symbolic interactionism and identity theory as will be explained in the following sections.

Mead’s notion of self is composed of an 'I' and a 'me'. The 'I' thinks and initiates action and 'me' perceives and guides the 'I'; the self as an object has an awareness of self existing for others (Swingewood, 2000). The notion of ‘I’ is “both biological and social...[which is] not, therefore, easily separated from the ‘me’” (Swingewood, 2000, p. 168). Together they act simultaneously to "bring about and maintain the person in relationship to the environment and to others in the situation" (Burke & Stets, 2009, p. 21).
Personal identity is the self we know, which is not the same as self-concept. Christiansen (1999) goes on to say that the term “self-concept refers to the inferences we make about ourselves” and “encompasses our understanding of personality traits and characteristics, our social roles, and our relationships” (p. 548). As adults, we strive for internal consistency in how we view ourselves. We aim to maintain favourable views and avoid any feedback that would be a different to what we believe to be true about ourselves. When we do perceive a discrepancy, we are motivated to change and realign ourselves so that internal consistency is achieved. Christiansen (1999) states that “self-concept is entirely created in one’s mind, whereas identity is often created by the larger society, even though it is often negotiated with others and refined by the individual as a result of those negotiations” (p. 548).

Literature on working with those with a disability stresses the importance of the well-being of the patient and also addresses the importance of self-esteem. Self-esteem does not have as prominent a role in the literature related to individuals working with natural resources as the term does in occupational science literature; however, that does not mean that the role self-esteem plays is not important or apparent. Self-esteem “refers to the evaluative aspect of self-concept” (Christiansen, 1999, p. 548). Self-esteem is tied to our ability to demonstrate ‘efficacious action,’ and can gain social approval thus influencing a more positive or favourable concept of self. Previous research on identity indicates that individuals strive to see themselves in a positive light grounded in their various roles which are salient and socially important (Ashforth & Kreiner, 1999). Identity continuity or being able to identify yourself in a similar fashion after a disability or hardship is equally important (Wiseman & Whiteford, 2007). One participant in that study who listed himself as a life-long politician, but no longer actively involved, still watched the City Council meetings when broadcast on television every two weeks. In doing so, he continued to identify himself as a politician. This man’s self-esteem was kept high because he still held that thread of connection to the political world (Laliberte-Rudman, 2002). Farmers, likewise, take great pride in their stock and crops near roads where other farmers are able to see and compare with their own. Having weed-free crops and good-looking stock increases the self-esteem that the farmer holds. When a farmer comments negatively regarding a practice that the farmer did or should do, the farmer feels an internal inconsistency
and is motivated into action to realign his sense of self, self-concept and self-esteem (Burton, 2004b).

**Place based identity**

Literature dealing with identity in the natural resource sector is by-and-large connected to some sort of place-based identity. The reference to environmental identity, rural identity, place identity, connectedness to nature, or place attachment appears in nearly every journal article related to farming included in this literature review. Proshansky (1978) state that “place-identity is a theoretical construct quite necessary for understanding the development and expression of the other sub-identities of the individual, e.g., sex, occupation” (p. 156). Clayton (2003) describes environmental identity as how we orient ourselves to the natural world. An environmental identity “prescribes a course of action that is compatible with individuals’ sense of who they are” (Clayton, 2003, p. 2). A stronger environmental identity is associated with more positive attitudes toward the environment (Hinds & Sparks, 2008), however in a study conducted by Nunkoo and Gursoy (2012) the determination was made that “environmental identity was found to be an independent predictor of one’s support (behaviour), but not a determinant of one’s attitude” (p. 260). Gosling and Williams (2010), maintain that environmental identity incorporates both an emotional association and identity with nature.

Experiences in the natural environment may foster place-identity which is defined as “dimensions of the self that define the individual’s personal identity in the relation to the physical environment by means of a complex pattern of conscious and unconscious ideas, beliefs, preferences, feelings, values, goals, and behavioural tendencies and skills relevant to this environment” (Proshansky, 1978, p. 155). The formation of an attachment to place and nature is thought to further develop one’s identity (Clayton & Opotow, 2003). While connectedness to nature is the extent to which an individual feels a part of nature, place attachment is a “positive connection or emotional bond between a person and a particular place” (Gosling & Williams, 2010, p. 299). As households move between the city and country more fluidly, the place-based identities that they hold become more fluid (Golding, 2012).
Identity formation in a rural community faces modern nuances. Impacts of residential mobility and the meaning of rural socially impacts the meaning of rural personally. As Golding (2012) states, residents who are mobile form a cosmopolitan identity which allows them to more easily feel comfortable into a new setting as they are able to incorporate their distinctive past experiences into their new identity. Bell (1994), in Golding (2012), remark of observations of Childerley [a fictitious rural British town], and “how a ‘country’ identity among newcomers elicits a ‘real country’ identity among longer term residents” (p. 1030). Secondly, the perception of how rurality is shaped socially influences how an individual will perceive what it means to be rural personally. As rural towns become more urban (i.e. amenities available or an increase in cultural diversity), rural identity now means that “rural origins connote an increasingly peripheral social and cultural status, influencing how others perceive rural people and thus how rural people perceive themselves” (Golding, 2012, p. 1031) (tapping into the CIC dimension of evaluation). Rural identity is influenced by the socio-cultural significance of being rural and individuals can fall along a place anchor dimension in forming that identity. On one end of the dimension is having a connection to a specific place and on the other is having a connection to the perception of a type of place. As Golding (2012) illustrates, an old-timer, “among a sea of new-comers” rejects having his family’s property come under state jurisdiction and “his attachment to place becomes even more salient to his opinions about land use because his family legacy distinguishes him from others and fosters a sense of entitlement” (p. 1038).

Assessing occupational identity amongst rural landholders

Previous research efforts have utilised inconsistent variables to assess occupational identity in a natural resource or an agricultural context. Many efforts lack a strong theoretical foundation. An additional critique of assessment attempts is the omission of certain types of landholders. Emtage, et al. (2006) highlighted that limited attention has been given to the non-farming cohort of rural landholders despite evidence that non-farming identities are likely to be significant influences on NRM in rural landscapes. Yet not all research has ignored the small landholders. Gill et al. (2010) classified new rural landowners near Sydney, Australia into three types (i.e. lifestyle agrarian, regenerative, conservationist). Although this research largely ignored
the farmer cohort, Gill et al. (2010) illustrated heterogeneity within this small segment of landowners.

Unlike other efforts, Curtis and Mendham (2012) drew on data from their surveys of representative samples of all rural landholders in regions in south eastern Australia to distinguish between those who self-declared as farmers and those who nominated any other occupation (e.g. teacher, plumber, doctor, accountant). Respondents were subsequently classified as farmers or non-farmers. Curtis and Mendham (2012) were able to distinguish farmers and non-farmer landholders, including in terms of their different values, beliefs, attitudes and some land management practices. As an example, individual’s who self-identified as a farmer were more likely to implement no-till or minimum tillage, and less likely to have areas of trees and shrubs planted when compared to those classified as a non-farmer (Curtis & Mendham, 2012).

To measure occupational identity, some quantitative studies have asked respondents to self-declare their occupation using either the selection of a pre-defined descriptor or an open-ended question (Curtis & Mendham, 2012; Race et al., 2012). This approach has intuitive appeal, is efficient in that the item(s) occupy a small space in a survey and has been shown to effectively distinguish farmers and non-farmer landholders (Groth et al., 2014; Postmes et al., 2013). However, using self-declaration to derive an occupational identity is limited in that this approach is reliant upon only one aspect of a multi-faceted concept. As the non-farmer cohort of rural landholders increases, it is expected that occupational identity will be an increasingly important factor affecting NRM (Gosnell et al., 2007; Mendham et al., 2012).

Studies show that the farmer self-concept is multi-faceted and is comprised of multiple identities within itself (e.g. agricultural producer and/or conservationist) “each with different notions of what comprises good farming practice and each capable of becoming the focus for action” (Burton & Wilson, 2006, p. 100). Issues relating to what ‘good farming’ means and how this conceptualisation reflects back on an individual’s farming skills and social cultural capital (Burton, 2004b; Burton & Wilson, 2006) are other facets relating to farmer identity. Farming is often viewed as more than just a job: it is seen as a way of life with a deeper meaning than simply a form of employment (Vanclay, 2004). Indeed, the autonomy associated with farming is viewed
as a core value of a farmer identity (Stock & Forney, 2014). That feeling of independence is often hampered by competition from other farmers (Emery, 2015) in the fear of being perceived as implementing bad land management leading to decreased reputation status (Emery & Franks, 2012). The definition of ‘good farming’ ideals changes with each context (Sutherland & Darnhofer, 2012). Off farm income can contribute to a changed perspective of farm life from one that is focused on work to one with an end goal of personal satisfaction (Sutherland, 2012). This shift from a full-time to a part-time farmer may compromise the individually held definition of a ‘real farmer’ (Forney & Stock, 2014).

A shift of occupations in the farming community can lead to confounding results of identity measures that rely purely on self-declaration as individuals now relate to more collective identities than before (Wilson et al., 2013). Often, rural landowners do not see themselves as being able to be classified simply as one type of farming landholder; they exhibit and identify with multiple characteristics of a variety of landholders. Indeed, landowners may not be willing to associate with a term that is identified as socially undesirable (Howden & Vanclay, 2000). These trends complicate what being a farmer entails as conceptualisations of this term may be influenced not only by engaging in agricultural production but may also include a variety of other concepts that were not traditionally linked with the concept of a farmer identity.

**Measuring collecting identity: The collective identity construct (CIC)**

The collective identity construct (CIC), as developed by Ashmore et al. (2004), draws from two main theories - identity theory (IT) and social identity theory (SIT). Social identity theory analyses individual’s behaviour in group settings (Stets & Burke, 2000), and identity theory postulates that a person’s identity can influence their attitudes and behaviour (Stryker & Serpe, 1982). CIC also draws from a nigrescence model and the self-categorisation theory (SCT). Ashmore et al.’s (2004) CIC is a foundational model for viewing the dimensions that could be included in theories of identification. Ashmore et al. (2004) do not profess their collective identity construct to be a theory – only a general conceptual framework.

The CIC contains dimensions that indicate the relative strength of an individual’s collective identity. Unlike Klandermans, et al. (2002) who identified four aspects of
collective identity, Ashmore, et al. (2004), argue that there are seven dimensions. The collective identity proposed by Ashmore et al. (2004) include the dimensions described by Klandermans et al. (2002) and also incorporate the dimensions of importance, social embeddedness, and content and meaning. Ashmore et al. (2004) acknowledge that not every dimension needs to exist in all identity theories. Table 3 provides brief definitions of the seven dimensions [see also Figure 2].

Ashmore et al. (2004) emphasise that the dimension of self-categorisation is the “precondition for all other dimensions of collective identity” (p. 84). To illustrate the nature of those relationships they explain that for a person “to feel proud of being a member of a particular group [i.e. assessing the dimension of evaluation], ... I must first place myself into this category” (p. 84) (i.e. assessing the dimension of self-categorisation). Ashmore et al. (2004) provide examples of items to operationalise their seven dimensions. Examples include asking respondents to rate a collective identity in terms of importance to self-concept (i.e. assessing the dimension of importance), or asking a respondent if what happens to a group in which they belong will affect their own lives (i.e. assessing the dimension of attachment and sense of interdependence).

<table>
<thead>
<tr>
<th>Table 3 Collective Identity Construct dimensions, adapted from Ashmore et al. (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension</td>
</tr>
<tr>
<td>Self-categorisation</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Importance</td>
</tr>
<tr>
<td>Attachment and sense of interdependence</td>
</tr>
<tr>
<td>Social embeddedness</td>
</tr>
<tr>
<td>Behavioural involvement</td>
</tr>
<tr>
<td>Content and meaning</td>
</tr>
</tbody>
</table>
Figure 2 Individual-level Collective Identity Construct adapted by Ashmore et al., (2004)
The seven dimensions of the CIC

**Self – categorisation**

Self-categorisation is the most basic element and core of the CIC. Identifying as a member of a particular social group sets the foundation and is a prerequisite for all remaining dimensions of the CIC (Phinney, 1995). Individuals place themselves into a group they share the most similarities with (Ashmore et al., 2004, p. 84). Social categorisation includes “the process by which individuals identify the salience of particular social groups which comprise their worldview,” revealing the organisation of an individuals’ world and how they perceive themselves (Andrews, 1991, p. 26). The self-categorisation of oneself into a group can lead to in-group-favouring behaviour, observance of group norms and in-group loyalty (Bartel, 2001). However, as Phinney (1995) explains, how someone categorises themselves is dependent on choices including the salient goals and motives at a particular time. Even within a particular group, an individual can identify with multiple similar identities within the overall category (Ashmore et al., 2004).

Researchers have employed a variety of approaches to measure an individuals’ collective identity [Table 4] including both open and close-ended questions. For example, in one study, analyses of self-identification as a feminist was obtained by directing participants to answer questions if they considered themselves to be a part of this group. Thus in answering the questions participants categorise themselves as a feminist. Ashmore et al. (2004) agree with the use of open-ended questions to identify collective identities, but remark that these measures only confirm whether a person places themselves within that category – providing no information on importance of the category, or how the individual views themselves related to other category members (i.e. prototypical or marginal group member).
Table 4 Representative Measures of Identity: Self - Categorisation (adapted from Ashmore, et al (2004))

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placing self in a social category</td>
<td></td>
</tr>
<tr>
<td>Ethnic self-definition</td>
<td>“In terms of my ethnic group, I consider myself to be ____”</td>
</tr>
<tr>
<td>Self – identification</td>
<td>Participants pick a word from a pair (e.g., Black – feminine).</td>
</tr>
<tr>
<td>Group identity</td>
<td>Women are asked to choose from a list of groups (including women and feminists) those to which they feel they belong and then “Indicate how much you identify with (or feel a part of) that group” (1-5 scale).</td>
</tr>
<tr>
<td>Behavioural measure of acceptance of the label feminist</td>
<td>“If you consider yourself to be a feminist, please answer the following question.”</td>
</tr>
<tr>
<td>Goodness of fit/perceived similarity/prototypicality</td>
<td></td>
</tr>
<tr>
<td>Goodness of fit</td>
<td>“I am a typical group member.”</td>
</tr>
<tr>
<td>Identification with school (ID&lt;sub&gt;group&lt;/sub&gt; subscale)</td>
<td>“Would you think it is accurate if you were described as a typical student of this school?”</td>
</tr>
<tr>
<td>Allocentrism – Idiocentrism Scale</td>
<td>Measures the perceived psychological distance of the self from several groups by asking participants to indicate the “distance” between self and group on a scale ranging from we are as similar as possible to we are as different as possible.</td>
</tr>
<tr>
<td>Perceived certainty of self-identification</td>
<td></td>
</tr>
<tr>
<td>Lesbian and Gay Identity Scale (Identity Confusion subscale)</td>
<td>“I’m not totally sure that I’m a [lesbian/gay man].”</td>
</tr>
</tbody>
</table>

Self-categorisation is not always obvious to an individual, which makes ascertaining perceived similarity or level of prototypicality and goodness of fit
important. Asking participants to identify their degree of identification with a group is problematic in that “existing measures of the degree or strength of identification tend to be multidimensional” (Ashmore et al. 2004, p. 85). This confounds “the assessment of the importance of the [element] ‘prototypicality … with the assessment of the importance of the identification as well as with felt attachment, both of which we view as separate and distinct dimensions” (Ashmore et al. 2004, p. 85). Measures identifying goodness of fit (a subjective assessment of being a prototypical member) allow researchers to collect information on participants who may not otherwise classify themselves as a member of a particular group and allows for distinction between levels of perceived prototypicality and identity-relevant behaviours (Ashmore et al., 2004).

Despite the issues identified above, a single item measuring the identification or classification by rural landholders was found to be a cost-effective and efficient way of classifying landholders (Groth et al., 2014). This study assessed the validity of using a single item where survey respondents self-declare their occupation by testing for significant relationships between farmer/non-farmer and variables expected to be proxies for occupational identity (OI) (e.g. property size, land use/enterprise, hours worked on property, paid off-property work, membership of farm related organisations, profit/income). The results of those analyses suggest this is a valid approach and one that is efficient in terms of the number of required measurement items in a survey. In that paper, the authors introduced the Ashmore et al. (2004) CIC construct as a widely accepted measure of OI that goes beyond self-declaration and therefore, as a potentially important tool for researchers. In a separate study, Postmes, et al. (2013) also found that a single-item social identification measure rating level of identification with a group or category would be a “simple, reliable, and short way of assessing identification” (p. 615). While such an approach does not provide information on the remaining CIC dimensions, it does provide an efficient assessment of the first and primary category of self-categorisation.
Evaluation

Ashmore et al. (2004) refer to evaluation as “the positive or negative attitude that a person has toward the social category in question” (p. 86). Evaluation is separated into two elements described as private and public regard [Table 5]. In general, private regard is the evaluation made by others about an individual’s particular identity while public regard is the “perceived evaluation of others, that is, how positively or negatively I think people in general view my group” (Ashmore et al., 2004, p. 86). Ashmore et al. (2004) state that private regard is typically measured using a Likert type scale to provide a range of private evaluation. A 7-point Likert scale may be used for the statement “I am happy that I am Black” with strongly agree and strongly disagree anchoring the scale. A ‘feeling thermometer’ is sometimes accompanied by a scale, varying from 0 to 100, to assign cold/negative to warm/positive associations with statements of collective identity using positive or negative adjective connotations (proud, satisfied, regret, etc.).

Table 5 Representative Measures of Identity: Evaluation (adapted from Ashmore et al (2004))

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private regard</strong></td>
<td></td>
</tr>
<tr>
<td>Collective Self – Esteem (CSE; Private Acceptance)</td>
<td>“In general, I’m glad that I’m a member of this group.”</td>
</tr>
<tr>
<td>Multidimensional Inventory of Black Identity (MIBI; Private Regard)</td>
<td>“I am happy that I am Black.”</td>
</tr>
<tr>
<td>Identification with a superordinate group [subgroup]</td>
<td>“I am proud to think of myself as a member of the organisation I work for [my ethnic group].”</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>“In my religious activities, I am very satisfied.”</td>
</tr>
<tr>
<td><strong>Public regard</strong></td>
<td></td>
</tr>
<tr>
<td>Collective Self – Esteem (Public Acceptance)</td>
<td>“In general, others think that the social groups I am a member of are unworthy.”</td>
</tr>
</tbody>
</table>
Public regard is assessed less frequently. Examples of statements include “In general, others respect Black people.” and “In general, others think that the social groups I am a member of are unworthy” and “In general, others respect Black people”. Each measure asks for the respondents to estimate the level at which others value or devalue social groups that the respondent is a member of. Ashmore et al. (2004) acknowledge that private and public regard are not always correlated with each other, which is why the separation of the two is so important.

**Importance**

The third dimension of the CIC is importance. The dimension of importance contains the elements of explicit and implicit importance [Table 6]. Importance addresses the degree of significance, from low to high, of a specific group membership on an individual’s self-concept (Ashmore et al. 2004). Explicit importance is “the individual’s subjective appraisal of the degree to which a collective identity is important to her or his overall sense of self,” while “implicit importance is the placement, from low to high, of a particular group membership in the person’s hierarchically organized self-system, where the individual is not necessarily consciously aware of the hierarchical position of [their] collective identities” (Ashmore et al., 2004, p. 87).

**Table 6 Representative Measures of Identity: Importance (adapted from Ashmore et al (2004))**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit importance (also identified as <em>significance, strength, centrality, importance, prominence</em>)</td>
<td></td>
</tr>
</tbody>
</table>
Psychological centrality  
Rate the importance of the identity on a 10-point scale from *not at all to very important*

<table>
<thead>
<tr>
<th>Implicit importance (also identified as <em>salience, centrality, importance, elevation</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salience “What one thing would you tell a stranger about yourself?”</td>
</tr>
<tr>
<td>Cognitive centrality “How often in your everyday life have you thought about being a woman?”</td>
</tr>
<tr>
<td>Elevation Participant lists selves (including collective identities) and features (traits, feelings, and behaviours) and then rates each self on each feature. Degree of self (including a collective identity) is how high up in the self’s hierarchy the self-definition is.</td>
</tr>
<tr>
<td>Twenty Statements Test “Who am I?”</td>
</tr>
</tbody>
</table>

Explicit importance is referred by many scholars by numerous terms including ‘psychological centrality’ (Stryker & Serpe, 1994) which refers to the centrality of a self-definition on a person’s overall self-concept. Other terms including “hierarchy of prominence” (McCall and Simmons, 1978 as found in Ashmore et al., 2004) and Rosenberg’s notion of ‘centrality’ (Rosenberg, 1981) are terms Ashmore et al. (2004) deem as a slight variation of explicit importance.

Salience is the basis for implicit importance and is defined as “a readiness to act out an identity as a consequence of the identity’s properties as a cognitive structure or schema” (Stryker & Serpe, 1994, p. 17). Stryker and Serpe (1994) contend that people are not necessarily conscious of the salience of their own collective identities. Seymour Rosenberg’s conceptual framework (1988, 1997; as found in Ashmore et al., 2004) measuring implicit importance identified the hierarchical arrangement of the multiple selves within an individual. An individual rates each of their selves (including collective identities) on a set of
features (e.g. behaviours, traits, feelings). Identities higher in the hierarchy are more accessible and are more applicable in a wider variety of situations.

The Identity subscale of the Collective Self-Esteem (CSE) is just one example of a measurement technique [Table 6], which Ashmore et al. (2004) consider to be “perhaps the purest operational definition of explicit importance” (p. 88) as it focuses on importance to identity. Asking respondents to rate a collective identity in terms of its importance to self-concept is another method. This method was employed by Stryker and Serpe (1994) who asked respondents to make comparative judgments between a set of actions or to rate collective identities on a single scale. A common operational definition of implicit importance is to ask “respondents to imagine meeting someone for the first time and to indicate which piece of information (collective identity) about self would be told first, second, and so on”. Stryker and Serpe (1982) acknowledge that this “only partially and imperfectly captures the construct” (Ashmore et al., 2004, p. 88).

**Attachment and sense of interdependence**

The affective involvement that a person feels to a particular social category or the degree of mutual fate between the social group and one’s personal fate is the fourth major dimension of CIC and is entitled ‘attachment and sense of interdependence’ (Ashmore et al., 2004). The emotional-affective aspect of belonging to a group may be “independent of categorisation and evaluation and, on its own, a strong predictor of important group outcomes” (Ashmore et al., 2004). Baumeister and Leary (1995) proposed that humans have an innate desire to form positive, enduring relationships. People who have the slightest bit in common will form bonds even if the similarities they share are adverse. At the same time, people will resist losing attachments and social bonds even if maintaining the relationship is difficult. Baumeister and Leary (1995) stated that “the need to belong can be considered a fundamental human motivation” (p. 521). We become members of groups to satisfy this need in part, and in doing so conform to the group norms. Cultures may use “social inclusion to
reward, and exclusion to punish their members as a way of enforcing their values” (Baumeister & Leary, 1995, p. 521).

Instruments of measurement of collective identity have an implied extension of the self to the larger group. The development of a sense of interdependence is fostered by the awareness of a common or shared fate by those in a social group (Ashmore et al., 2004). When people become aware that they are treated as a group member as opposed to an individual, and that their fate is similar to that of the group despite any differences that might arise, a sense of mutual fate is developed. Examples of how interdependence or perception of a common fate are included appear in Table 7 and include the example, “My fate and my future are bound up with that of Armenians everywhere.”

Ashmore et al. (2004) highlight two distinct approaches implemented to assess affective attachment toward members of in-groups. The first approach directs participants to indicate the degree of perceived common fate with a group, or whether that individual has a strong sense of attachment/belonging to the group. The second and “more indirect operationalisation of attachment to the group is to ask how strongly a person feels accepted, valued, respected, and supported by the group” (Ashmore et al., 2004, p. 91). The authors contend that affective attachment is a conceptually disparate dimension of collective identity.

The element of interconnection of self and others, or self-group merging, has both affective and cognitive components. Self-group merging is generally operationalised “with items that tap a person’s experience of the group as part of the self,” such as “When I talk about this organisation, I usually say ‘we’ rather than ‘they’” (Ashmore et al., 2004, p. 92).4 A reaction time procedure has also been used to highlight that people often confuse individual traits with typical in-group traits. Smith et al. (1999, in Ashmore et al., 2004) found that

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4 Work conducted by both Carroll (Carroll, 1995; Carroll & Lee, 1990) and Petzelka (Petzelka, et al., 2006; Petzelka & Marquart-Pyatt, 2011) also look at self-group merging, however they do not use that same term to explore the assimilation of oneself into a larger group.
substantial support exists for the idea that close relationships and group memberships involve a level of merging of the self and other, which could affect cognition, affect and behaviour in a group context or in personal relationships.
<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdependence/mutual fate</td>
<td></td>
</tr>
<tr>
<td>Sense of common fate</td>
<td>“Do you think that what happens to women generally will have something to do with what happens in your life?”</td>
</tr>
<tr>
<td>Mutual fate</td>
<td>“My fate and my future are bound up with that of Armenians everywhere.”</td>
</tr>
<tr>
<td>Affective ties</td>
<td>“Regarding my in-group, it is accurate to say, ‘United we stand, divided we fall.’”</td>
</tr>
<tr>
<td>Affective commitment</td>
<td></td>
</tr>
<tr>
<td>Attachment/closeness</td>
<td></td>
</tr>
<tr>
<td>Affirmation – Belonging</td>
<td>“I have a strong sense of belonging to my own ethnic group.”</td>
</tr>
<tr>
<td>Perceived acceptance and support</td>
<td></td>
</tr>
<tr>
<td>Respect</td>
<td>“Do others in the work setting respect the work you do?”</td>
</tr>
<tr>
<td>Group membership</td>
<td>“I feel accepted by members of my ethnic group.”</td>
</tr>
<tr>
<td>Interconnection of self and others</td>
<td></td>
</tr>
<tr>
<td>Merging of self and in-group</td>
<td>Reaction – time paradigm in which participants make timed self – descriptiveness judgments. Merging of self and in-group is measured as faster judgments of traits on which participants match the perceived characteristics of the in-group.</td>
</tr>
<tr>
<td>Cognitive merging of self and the group</td>
<td>“When I talk about this organisation, I usually say ‘we’ rather than ‘they.’”</td>
</tr>
<tr>
<td>Ethnic group introjections</td>
<td>“If something bad was said about Turkish people, I would feel almost as if it was said about me?”</td>
</tr>
</tbody>
</table>
Social embeddedness

Social embeddedness is “the degree to which a particular collective identity is implicated in the person’s everyday ongoing social relationships” (Ashmore et al., 2004, p. 92). Social embeddedness is considered high when the majority of one’s social contacts and relationships are reinforced by a collective identity and abandoning this connection would be personally costly and painful. These costs reference the strength of ties in a social network (Stryker & Serpe, 1994). Social embeddedness is “measurable at the level of the individual, and there are likely to be substantial individual differences in its occurrence,” while at the same time, “interpretation of such measures must take into account the opportunity structures that the environment provides for connecting to others on the basis of one’s collective identity” (Deaux & Martin, 2003 in Ashmore et al., 2004, p. 92). Stryker and Serpe (1994) operationalised commitment, which is Ashmore, et al.’s, (2004) proposed social embeddedness, by asking individuals the number of organisations they have joined and the number of relationships formed through those memberships.

Ashmore et al. (2004) distinguish affective attachment and social embeddedness by describing the former as more subjective and internal, while the latter is described as more objective and external. Affective commitment “denotes how close the person feels to a particular social category. Social embeddedness, in contrast, refers to the degree to which an individual’s collective identity is embedded in social networks and interpersonal relationships” (Ashmore et al., 2004, p. 92). When social embeddedness is high most of the social connections in everyday interaction will involve individuals from the social category in question; when social embeddedness is low few interactions are made on a daily basis with individuals of the specific category.

Behavioural involvement

Behavioural involvement is an obvious expression of the identity itself. Behavioural involvement is defined “as the degree to which the person engages in actions that directly implicate the collective identity in question”
One measure of behavioural involvement, as observed in Table 8, is “How often do you participate in a church-sponsored activity?” Identity theorists, such as Stryker, favour time in role as an outcome variable, and this is also described as an index of behavioural involvement (Ashmore et al., 2004). Other indices might include displaying the motto or logo of a group membership or donating time or resources to organisations that support the collective identity. Language usage is often used as a form of behavioural involvement when looking at the collective identities of ethnicity and nationality. Behavioural involvement is particularly relevant in landholder identity as is discussed later in this chapter.

**Table 8 Representative Measures of Identity: Behavioural Involvement (adapted from Ashmore et al. (2004))**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic behaviour subscale of the Multi-group Ethnic Identity Measure</td>
<td>“I participate in cultural practices of my own group.”</td>
</tr>
<tr>
<td>Latino/Latina cultural identity</td>
<td>Spanish proficiency (e.g., language spoken at home, Spanish writing capability)</td>
</tr>
<tr>
<td></td>
<td>Spanish language preference (e.g., language preference for TV and radio)</td>
</tr>
<tr>
<td>Religious Behaviours Scale</td>
<td>Church Involvement subscale measures religious commitment expressed through church attendance, Bible study/religious education, social activities, service, and financial support. “How often do you participate in a church-sponsored activity?”</td>
</tr>
<tr>
<td></td>
<td>Personal Faith subscale measures religious commitment through activities outside of church (private prayer, reading the Bible, basing one’s actions on faith, discussing faith with others). “How often do you spend time in private prayer or spiritual meditation?”</td>
</tr>
</tbody>
</table>
Ashmore et al. (2004) state that “like social embeddedness, behavioural involvement entails consideration of the person and the opportunity structure that the setting provides” (p. 93). Amount of time spent in an occupational identity, for example, is influenced by external factors including work day length policy, informal norms such as how late one is expected to be on the job and personal orientation. Therefore, Ashmore et al. (2004) suggest possible correlation between behavioural involvement and social embeddedness, while still being conceptually different. Social embeddedness “refers to the objective state of one’s social networks, whereas behavioural involvement denotes the extent to which one’s actions involve the social category” (Ashmore et al., 2004, p. 93). A word of caution, provided by Ashmore et al. (2004) regarding the possible associated reasons why people partake in behavioural involvement activities include obtaining acceptance into a group, to show solidarity, or to appease others who have certain expectations on their behaviour. These indices do not necessarily comprise unambiguous indices of collective identity.

**Content and meaning**

Content and meaning is the seventh and final dimension of CIC [Table 9]. This dimension is comprised of three types of content: self-attributed characteristics, ideology, and narrative. Content is less accessible with a single scale and typically require more than one scale to measure adequately. Ashmore et al. (2004) contend that “the concern here is with the semantic space in which an identity resides – a space that can include self-attributed characteristics, political ideology and developmental narratives” (p. 94). Quantitative and qualitative approaches are utilized to access content and meaning in collective identification.

The element of self-attributed characteristics refers to “the extent to which traits and dispositions that are associated with a social category are endorsed as self-descriptive by a member of that category” (Ashmore et al., 2004, p. 94). Measurement of self-attributed characteristics is implemented by asking a participant to rate how distinctive a group-related characteristic is to their own
identity. Many collective identities have stereotypes associated with them and some can become a part of one’s own identity as an individual adopts or transforms him/herself to fit or take on that characteristic. People are “likely to vary in the extent to which they define themselves in terms of consensual or stereotypical group-related attributes,” which has the potential to predict outcomes (Ashmore et al., 2004, p. 94).

A hierarchical classification method, as developed by De Boeck and Rosenberg (1988; in Ashmore et al., 2004), is one of the most developed approaches to measuring traits and their association with categories. Participants are asked to list self-descriptive traits and behaviours they associate with a particular identity category. Attributes that are the same and listed under different identity labels form the basis for development of an identity hierarchy, graphically representing a person’s set of identities. While personality traits are the focus as self-descriptors, Ashmore et al. (2004) contend it is possible to extend “the coverage to physical descriptors, behaviours, and values, all of which have some likely association with identity categories” (p. 94).

The element of ideology refers to the history and experience of the group in the past. Gurin and Townsend (1986, in Ashmore et al., 2004) called this ‘group consciousness’ which is “multidimensional, including components of collective discontent over a group’s relative power, resources, or prestige; appraised legitimacy of the stratification system; and a belief in collective action” (Ashmore et al., 2004, p. 94). Some measures used to assess ideological positions members of groups might hold is depicted in Table 9. Collective ideologies have many idiosyncratic aspects and variations within a group that may become more important than comparisons between multiple groups (Ashmore et al., 2004).
<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race-related ideology</strong></td>
<td></td>
</tr>
<tr>
<td>Multidimensional Inventory of Black Identity</td>
<td></td>
</tr>
<tr>
<td>Assimilation</td>
<td>“Blacks who espouse separatism are as racist as White people who also espouse separatism.”</td>
</tr>
<tr>
<td>Humanist</td>
<td>“Black values should not be inconsistent with human values.”</td>
</tr>
<tr>
<td>Oppressed minority</td>
<td>“Black people should treat other oppressed people as allies.”</td>
</tr>
<tr>
<td>Nationalist</td>
<td>“Black people should not marry interracially.”</td>
</tr>
<tr>
<td>Cross Racial Identity Scale (CRIS)</td>
<td></td>
</tr>
<tr>
<td>Pre-Encounter assimilation</td>
<td>“I think of myself primarily as an American and seldom as a member of a racial group.”</td>
</tr>
<tr>
<td>Pre-Encounter mis-education</td>
<td>“Blacks place more emphasis on having a good time than on hard work.”</td>
</tr>
<tr>
<td>Pre-Encounter self-hatred</td>
<td>“I sometimes have negative feelings about being Black.”</td>
</tr>
<tr>
<td>Immersion-Emersion anti-white</td>
<td>“I have feelings of hatred for all White people.”</td>
</tr>
<tr>
<td>Internalization black nationalist / afrocentricity</td>
<td>“Black people cannot truly be free until our daily lives are guided by Afrocentric values and principles.”</td>
</tr>
<tr>
<td>Internalization multiculturalist inclusive</td>
<td>“I believe it is important to have both a Black Identity and a multicultural perspective, which is inclusive of everyone.”</td>
</tr>
<tr>
<td><strong>Gender-related ideology</strong></td>
<td></td>
</tr>
<tr>
<td>Conservatism</td>
<td>“Women should not be assertive like men because men are the natural leaders on earth.”</td>
</tr>
<tr>
<td>Cultural feminism</td>
<td>“Women’s experience in life’s realities of cleaning, feeding people, caring for babies, etc. makes their vision of reality clearer than men’s.”</td>
</tr>
<tr>
<td>Liberal feminism</td>
<td>“The availability of adequate child care is central to a woman’s right to work outside the home.”</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Radical feminism</td>
<td>“The workplace is organized around men’s physical, economic, and sexual oppression of women.”</td>
</tr>
<tr>
<td>Socialist feminism</td>
<td>“Capitalism and sexism are primarily responsible for the increased divorce rate and general breakdown of families.”</td>
</tr>
<tr>
<td>Womanism</td>
<td>“Racism and sexism make double the oppression for women of colour in the work environment.”</td>
</tr>
</tbody>
</table>

The final section of content and meaning is narrative. A narrative is “the internally represented story that the person has developed regarding self and the social category in question” (Ashmore et al., 2004, p. 96). Ashmore et al. (2004) create two subgroups of narrative: collective identity story and group story. Collective identity story is a mentally represented narrative as a member of a group or ‘story of me as a group member’. This mental representation includes images, thoughts and feelings about the past, present and future as a member of a particular group. These authors believe that narrative can be measured quantitatively as well as qualitatively even though it has not been fully operationalised and is acknowledged that individuals from minority groups and dominant groups may have different depictions of a collective identity story.

Group story is the story of a particular group in which one belongs. ‘Story of my group’ includes a person’s ideas, emotions and mental images of the past and present and likely future relating to a group. A group story can include both factual and mythical constructions of past events. Social representation of a group’s story as conveyed though the media and official government documents crafts a ‘master narrative’ that often highlight the positives and hides the indecencies, prejudices and injustice that is experienced by the minority groups (Ashmore et al., 2004). In CIC, the social representations of a groups’ story and the social realities (i.e., power) comprise part of the context.
which individuals ‘develop, experience, and enact’ their individual collective identities.

**Review of CIC**

Brewer and Gardner (1996) state that if acknowledging that “different levels of identity represent different perspectives for interpreting social reality, collective identity theory becomes a comprehensive theory for understanding variability within as well as between individuals” (p. 92). CIC provides seven dimensions that may lead to operationalisation of occupational identity in an individuals’ collective identity. Correlations between the CIC’s seven dimensions are usually moderate in size, suggesting that collective identity is multi-dimensional and not a unidimensional construct (Ashmore et al., 2004). Baumeister and Leary (1995), in their review of the motivation to belong, concluded that individuals are fundamentally and pervasively driven by a need to belong, and maintain lasting positive interpersonal attachments. Ashmore and colleagues recognize that not all seven dimensions need to be present in all identity theories, but identify the broad range of dimensions that exist in a collective identity.

I now move on to discuss the focus of this thesis and one type of collective identity, occupational identity. I’ll first discuss the wider occupational community in which we all are situated in. I then provide literature to explore the importance of an occupational identity and occupational title. Then I will provide a critique of utilising the collective identity construct to assess occupational identity.

**Occupational community**

A community can be bound by a network or territory, but as Carroll (1995) claim people who reside in the same location may not necessarily share much in common with their neighbours, excluding them from the community. Therefore, this should be accepted as a variable rather than a constant when considering community. Hillery (1955) in (Furze & Stafford, 1994) found over 90 definitions of community in the literature with common elements of humans living in a locality and interacting with each other. Some definitions “stressed relational factors, others territorial ones, and still more a sense of belonging” (Furze & Stafford, 1994, p. 312). Salaman (1971) suggests that occupational communities fall along an isolation scale; on one end is a
‘quasi’ occupational community in which those communities are geographically isolated, (often the case with coal miners) and on the other end is a ‘true’ occupational community in which geographic isolation or occupational homogeneity in the area is not required. Members of occupational communities have to some degree, a common life and see themselves as set apart from the rest of society. Members rely on others within the occupation to develop and reinforce their own self-image, while membership is also “marked by high levels of involvement in work and notably, its symbolic attributes” (Carroll, 1995, p. 28). For example, members in different branches of the U.S. armed forces have a historic rivalry between the branches of defence which leads to a sense of ‘we’ and ‘them’ based on the different interpretations of work (Carroll, 1995). Other attributes that strengthen an occupational identity include elements of danger, “the belief that one possesses rare, valued or esoteric skills, and the sense that one is responsible for the well being of others,” thus setting themselves apart from the rest of working society (Carroll, 1995, p. 28).

It is agreed that an occupational community will have a set of shared values, norms, meanings and common attitudes, in addition to the overlap and convergence of work and non-work social relationships (Becker & Carper, 1956; Carroll, 1995; Carroll & Lee, 1990; Salaman, 1971). Members of a particular occupational community often choose to spend off-work time with those in the same profession as they share the same “occupationally specific world view” (Carroll, 1995, p. 30). Van Maanen and Barley (1984) in Carroll (1995) view an occupational community with four elements: “people who regard themselves to be involved in the same sort of work, whose identity is closely tied to that work, who share ‘values, norms and perspectives’ linked to, but extending beyond, the work setting, and whose social relationships ‘meld the realms of work and leisure’” (p. 91). Individuals form a distinct self-image that is shaped by their occupational affiliation (Davis, 1986). Members do not try to separate their work and non-work lives as they subsume the role of their occupation, their work influences their activities and interests.

Salaman (1971) describes three basic determinants of occupational communities: “the involvement in work tasks, marginal status or stratification situation, and the inclusiveness of the work or organisational situation” (p. 59). Involvement includes the attitude towards the work, with elements such as danger, skill level and the status of
the job adding to a greater personal investment in it. Loggers, miners, and firefighters, among other occupations, all fit into the category where an individual would express high levels of involvement. Marginality occurs when a member wishes to associate themselves with someone of a higher status and is rejected. That individual then associates with members of their own occupation who can confirm and support their status claims as they identify themselves similarly. Salaman (1971) states that it is “likely that members of marginal occupations will see themselves in terms of the occupational roles, for this role probably offers the highest status and most flattering self-image available, even though some outsiders deny the legitimacy of these status claims” (p. 64). Individuals are often unsuccessful associating with those of a higher status because they overestimate the status position of their own occupation. Lastly, inclusivity refers to the features of an occupational role that affect non-work activities and interests and are restrictions on their opportunities.\(^5\) The author states that in all known cases of occupational communities at least two of the determinants (involvement, marginal status, and inclusiveness) are present with involvement (i.e. attitude towards work) always present as “there are no known cases of occupational communities where members are not strongly and positively involved in their work skills and tasks” (Salaman, 1971, p. 69).

A further distinction between occupational communities is the degree to which they are accepting/open to others in their trade. A local occupational community is one that is interested in their local town or immediate work site, while a cosmopolitan occupational community is one based on the occupation as a whole regardless of locale (Salaman, 1971).

\(^5\) Salaman (1971) proposes three types of inclusivity: pervasiveness (i.e. membership organisations or the execution of routine tasks – the army), organisational embrace (i.e. organisations which supply all facilities that an individual requires in an effort to exert control – asylums), and restrictive factors (i.e. the lack of flexibility and the nature of the job itself – travelling musician). Only organizational pervasiveness is “directly related to men basing their self-image on their occupational role” (Salaman, 1971, p. 68).
Importance of an occupational identity

An occupational community creates a platform for group members to share a common life with other ‘in-group’ members and develop their identity based on those interactions (Carroll, 1995; Carroll & Lee, 1990). Occupational identity is created from working within a particular occupation and natural resource users (farmers, loggers, etc.) can become extremely attached to their occupation (Marshall et al., 2012). For many individuals, a professional identity “may be more pervasive and important than ascribed identities based on gender, age, ethnicity, race or nationality” (Hogg & Terry, 2000, p. 121). Individuals spend 35% to 55% of their waking hours in the workplace presenting the opportunity to form a strong connection with and to their occupational identity (Stoner et al., 2011). The notion that an individual has a “strong occupational self means that the occupational role identity ... assumes a place of prominence in the set of role identities that individuals carry around as a normal product of socialization” (Carroll, 1995, p. 27) (this touches on the dimensions found within the CIC).

Carroll’s research on logger’s occupational identity found four interrelated themes: independence, pride in skill, pride in facing danger, and a sense of being in a unique category of workers (Carroll, 1995; Carroll & Lee, 1990). For the logger, an occupational identity fosters an intense attachment to the occupation and provides a sense of empowerment and identity. A logger faced with not having the ability to work in the woods loses an important part of his identity. As Marshall et al., (2012) remark, losing the opportunity to continue to earn a living in your current occupation can lead to a loss of an important part of self-identity.

For some loggers, performing this type of work is all that is acceptable to them to make a living, some say it is ‘in their blood’ (Carroll & Lee, 1990). Farmers and fisherman, when asked why they chose their respective occupation, will often remark that it is also ‘in their blood’ (Abrams & Bliss, 2012; Burton, 2004b; Davis, 1986). Marshall et al., (2012), researched the ability/interest of peanut farmers in Queensland to change location or occupation if the need arose with unfavourable weather patterns and fear of drought. The researchers found that the more attached a person was to their occupation, the harder it was for them to change that occupation. Survey results from the peanut growers indicated that peanut farmers are highly
attached to their place and occupation, but many farmers would consider an
alternative occupation (within the same realm of farming) if their current way of life
would become economically unfeasible. In many respects these farmers could ‘hold’
onto their farmer identity even if switching the focus of their farming practice.

There is an inherent need to feel like you are a part of something bigger (Baumeister &
Leary, 1995). This need to be connected to an occupation is also stressed in the
literature from the occupational science field. After a life-changing event when an
individual is no longer able to perform, as was once considered ‘normal’ that individual
struggles to form some sense of normalcy from their new hardship/disability. These
individuals will often find some sort of connection / activity to maintain that
connection, and in some ways that occupational identity, with their previous
occupation (Christiansen, 1999; Laliberte-Rudman, 2002; Unruh, 2004).

**Occupational title**

As important as it is to maintain a certain identity, research has indicated that the
occupation title itself is also important. Becker and Carper (1956) interviewed fifty-one
male graduate students studying either physiology, philosophy or mechanical
engineering to study the role that occupational title had on occupational identity.
Interview analysis led to the identification of four major elements of work
identification: occupational title and associated ideology, commitment to task,
commitment to particular organisations/institutional positions, and a significance for
one’s position in the larger society. Occupational title carries a great deal of symbolic
meaning. Some individuals will gladly accept the title, yet others will reject the title
referring to a specific work in favour of some larger field or vice versa. An occupational
title, with all its implications, “may thus be an object of attachment or avoidance, and
kinds of identification may fruitfully be compared in this regard” (Becker & Carper,
1956, p. 342). The ideology infers "that anyone called 'engineer' has learned to reason
so rationally and effectively that...the engineer is equipped to solve any kind of
problem in any area quickly and efficiently" as they are trained to think logically and be
analytical (Becker & Carper, 1956, p. 343). The engineers and physiology students
were happy to refer to themselves as such. Philosophy students, however, chose "their
occupational title simply as the least undesirable one available..."- one which still
allowed them to deal with varied interests in many different specialities (Becker & Carper, 1956, p. 343). Identifying with a profession comes hand in hand with the expected roles that profession fills. Physiology students for example cannot imagine that they would become a department head for example because they are unable to "envision themselves occupying any but the few positions they know of in which they can pursue these problems in the way they know best" (Becker & Carper, 1956, p. 348).

Becker and Carper (1956) have addressed the importance of title, but in subsequent work by more recent authors, this topic is not approached head on. In the work conducted by Carroll (1995) and Carroll and Lee (1990) on loggers, the focus on occupational title is largely implied in that those in the logging occupation take pride in calling themself a logger. Perhaps this is similar to anyone in an occupation that requires a unique skill set to accomplish. Farmers for instance, often learn from, and are brought up in, a farming community; they associate what a farmer is from their experiences (social interaction/social identity) and their internal interpretations (personal identity).

**Occupational identity and the collective identity construct**

Studies have coincidently drawn upon some dimensions, but not every element within a particular dimension, of the CIC. Carroll and Lee (1990) for instance investigated the logging industry in the USA Northwest and established that individuals were very attached to their occupation and believed logging was a valuable occupation (e.g. addressing aspects of the CIC dimensions of self-categorisation and attachment and sense of interdependence). Carroll (1995) had previously established a link between a strong resource-based OI and socialisation (e.g. the CIC dimension of social embeddedness) with others in the same industry. That process had contributed to, and reinforced, a multigenerational identification with logging - summed up by the statement that logging “gets in your blood” (Carroll, 1995, p. 92). Carroll (1995) also established that those working in natural resource industries exhibit a strong attachment (e.g. the CIC dimension of attachment and sense of interdependence) to the natural resources in which their work embeds them.
Following on Carroll’s work, Petzelka et al. (2006) developed a scale to measure the strength of natural resource-based occupational identity amongst local residents in three communities in the USA states of Utah and Wyoming to address resident support for tourism development. Survey respondents were asked to rate their involvement in four voluntary natural resource based groups (i.e. local watershed council, local irrigation district group, water conservation district group, and agricultural production organisations). Attachment to natural resources was measured by a respondent’s rating for two statements: the importance of “preserving opportunities for traditional multiple-use activities such as grazing/logging, and the importance of ability to earn a living off the land (e.g. farming, logging)” (Petzelka et al., 2006, p. 699). A summated index was created using both the involvement and attachment measures. The findings suggest that a stronger occupational identity (and generally more reliant upon resource-based occupations) led to weaker support for tourism activity. This early effort to measure OI in a natural resource context appears to touch on only the CIC dimensions of behavioural involvement and importance.

Nunkoo and Gursoy (2012) added to the approach of Petzelka et al. (2006) by including five additional survey items measuring involvement with local natural resource organisations (e.g. agricultural production organisations, sugar investment trust, small planters associations, farmers’ service corporations) arguably drawing from the CIC dimension of behavioural involvement. Both studies found OI to be an important component in predicting support for and attitudes toward the tourism industry.

Outside of the natural resource context, Stoner et al. (2011) also utilised some of the dimensions (self-categorisation, behavioural involvement, and attachment and sense of interdependence) of the CIC to test the possibility of developing a scale applicable to a variety of identities (e.g. identities based upon organisation, social group, and family). While their resulting scale was not relevant to the assessment of occupational identity in the NRM context, their research has informed my approach.

The majority of studies explored employ a largely qualitative approach to determine an individual’s occupational identity (Carroll, 1995; Carroll & Lee, 1990) with some use of quantitative approaches (e.g., Petzelka et al., 2006), and draw heavily from the
self-categorisation CIC dimension with weaker associations to other CIC dimensions. Coincidental use of variables that draw from a small number of CIC dimensions is apparent in landholder classification studies. Research examining land ownership motivations in central Texas “measured self-identity as a rancher or farmer, using four items (e.g., Ranching/farming is an important part of who I am) with a 7-point scale (strongly disagree to strongly agree)” (e.g. the CIC dimensions of self-categorisation and importance) in addition to such measures as age, education, employment status and income (Sorice et al., 2012, p. 59).

Landholder classification

Self-categorisation, the basis of CIC, is used in numerous ways to segment types of landholders. For instance, permanent residents form place-based collective identities to distinguish themselves from more educated, wealthier second homeowners whom they consider to be ‘outsiders’ to their region (Armstrong & Stedman, 2013). While the permanent residents perceived there to be a culture clash between themselves and the ‘outsiders’, the second homeowners perceived less intergroup tension as they themselves did not form a collective identity based on their seasonal residency. A mix of variables is often utilised to group landholders based on shared similarities and form a typology or other mechanism of classification (e.g. script).

Typology

A typology is a classification system utilising certain variables to group individuals. Smith (1981) describe a typology as a way to summarize “large amounts of raw data” (p. 100). Typologies can range from a “simple, crude” list, in which each type has no “clear logical relationship to the others,” to a more “systematic and logical compound of a small number of attributes” (Smith, 1981, pp. 100-101). Typologies have been created to identify numerous social groups. For instance, the four variables or perspectives of virtue, evaluative, developmental and structural have been used to identify how positive identities are formed in the workforce (Dutton, 2010). Many typologies have been created to categorise rural landholders using variables such as income, property size, and land use. Ashforth and Kreiner (1999) analysed the creation of positive identities in so called ‘dirty work’ which included aspects of a physical, moral or social taint. The occupation of a farmhand was listed among other
occupations associated with a physical taint (i.e. performed under noxious and/or dangerous conditions). Identity theory and social identity theory provide a framework for understanding how this negative stigma from others might reflect and influence those being viewed in a negative light. Individuals will often group themselves with others who share characteristics in common and in doing so lessen the chance of being cast in a negative light (Ashmore et al., 2004; Carroll, 1995).

**Farmer identity and classification into landholder typology**

Agriculture and NRM agencies often rely on such typologies to classify groups of landholders as they attempt to make sense of the diversity amongst the property owners they seek to engage. Engaging rural landholders in sustainable agriculture is complex and difficult, not least because there is a potentially large set of factors (personal, societal) influencing their decisions (Mazur et al., 2013; Pannell et al., 2006) and these vary according to each innovation, each landholder, each farming context and over time (Curtis & Mendham, 2011). Morrison et al. (2012) state the most studies of NRM landholder market segmentation lack an empirical basis or a strong theoretical underpinning for the selection of the segments. Although engagement with individual landholders can be very effective, it is not always possible or necessary. For example, it may be sufficient to develop a suite of policy instruments from across the “five P’s”: prescription, penalty, persuasion, property rights (and markets) and payment that meet the diverse needs of landholders (Salzman, 2005). Landholder typologies appeal as a way of enabling practitioners to effectively tailor their approaches to different landholder cohorts. That is possible when a typology identifies cohorts of rural landholders that are sufficiently distinctive and, at the same time, each cohort is comprised of individuals who are sufficiently similar (Dayer et al., 2014).

Most typologies still focus on commodity production and pay very little attention to the strategic behaviour of farmers (Hassink et al., 2012). For instance, grain farmers in Norway often have off-farm jobs as this type of farming is less labour intensive than working with some farm animals (Haugen & Vik, 2008); the goals/values of farmers with off-farm employment are different than farmers who explicitly work on their property. Gasson (1973) paved the way of identification of farmer goals and values based loosely on Maslow’s hierarchy of needs by recognizing the instrumental,
expressive, intrinsic and social values that farmers seek to obtain. Economically depressed farmers view farming as a means to provide sustenance while those who are financially secure may seek recognition from the farming community. Research in leisure activities (waterfowl hunting, fly-fishing, etc) have found that “when individuals identify with an activity, it becomes part of who they are rather than just something in which they participate” (Schroeder et al., 2013, p. 219).

Gender influences most social settings, including agriculture (Alston, 2006; Brandth, 2002; Brasier et al., 2014). Gender, as a social construct, can influence the roles and expectations of men and women. The influence of gender in an NRM setting is widely researched including a focus on perceived power inequality (e.g. Alston 2006) and the shift towards role equality (Brasier et al., 2014). While the power differential between men and women in a farming context will not be explored, this ‘inequality’ will be acknowledged briefly. In the exploration of power differentials between men and women in a farming context, Brandth (2002) stated that men are traditionally seen as the “farmer,” while the women are often seen as the “farmer’s wife.” As of 2007, women comprised 14% of principal farm operators in the United States (USDA, 2009 in Beach, 2013). Agriculture is heavily male dominated. The identity of men is “tied to their land ownership, occupational position as a farmer in the productive work they are seen doing” (Brandth, 2002, p. 184). The label ‘farmer,’ according to Haugen (1985 in (Brandth, 2002) addresses men and not women but the term ‘woman farmer’ is seen as equivalent as the male dominated label of ‘farmer’ (Brandth, 2002). Gender will not likely be an influential variable in every instance. For example, Reed’s (2003) examination of the role of women in the Canadian forest industry found that although different genders often completed different tasks, both men and women expressed similar ties to their occupation.

In work conducted by Beach (2013), interview analysis of Kansas farmers show a “movement away from traditional notions of family farms as patriarchal” perhaps due to the “changing structure of agriculture and the current economic challenges facing families...” (p. 16). Farming families are increasingly engaging in off-farm work to support farming activities even though traditional identities and roles of women in farming still exist. Beach’s (2013) discussion of her findings could “signal an opening in gender identities with more room for women to be farm women, to have identities in
relation to their off-farm employment (e.g., as a nurse or a microbiologist), and to be publicly recognized for their farm work” (pp. 16-17) even in the face of a male dominated agriculture sector.

Not surprisingly, within the realm of farmer occupational identities, there lie numerous subgroups. A few studies will now be explored in this section to identify how researchers are classifying different types of farmers / landholders. There are mixed reviews when it comes to terms used to classify landholders. Some researchers prefer to classify them broadly as farmer / non-farmer and others choose to describe them as productivist / non-productivist (Curtis, McDonald, Mendham, & Sample, 2008; Wilson, 2008). Beyond those broad classifications exists numerous types of farmers.

Primdahl and Kristensen (2011) suggested that farmers embody three different roles: producer, owner and citizen. The ‘producer’ is concerned with working the land itself, the ‘owner’ is legally responsible for land-use and habitat changes, and the ‘citizen’ participates in community life. These authors then identified five main categories of farmers (full-time farmer, part-time farmer, hobby farmer, pensioner, others), largely based on age and income. González and Benito (2001) took a different approach, and offered survey participants one of five farmer-type categories to choose from (labourer, property owner, eclectic, professional, businessman) and classification in a particular category was largely determined by the assets each participant had responsibility for (a different threshold value was assigned to each category). Kuehne et al. (2008) identified three different types of irrigators: investors, lifestylers and providers. Their typology was largely based on the extent of profit motivation and family involvement in the farm business. Research by Vanclay and colleagues (Vanclay & Enticott, 2011; Vanclay et al., 2006; Vanclay et al., 2007) have utilised farming styles, scripts and parables to classify various types of farmers. In short, farming styles are ‘strategies of farming’ that guide individual farmer practice and incorporate the worldviews of the farmer. Styles, scripts and parables were used as aids to explain the diversity, conformity and complexity that exist in different farming communities. However, Vanclay et al. (2006) regard “farming styles to be more an intellectual construction of social researchers, rather than a social construction of farmers themselves” (p. 5).
As Ikutegbe, et al. (2014) illustrated, most existing landholder classifications are based on proxy measures rather than direct measures of occupational identity as observed in the above classifications. Those proxy measures typically include economic (property profit or income), social (group affiliation) and/or environmental attributes (land management practices such as fencing waterways) (Jongeneel, et al., 2008; Sorice, et al., 2012), land use (Hassink, et al., 2012), value orientations (Gasson, 1973; Holmes & Day, 1995; Holmes, 1986; Kuehne, et al., 2008), and farming styles and scripts (Vanclay et al., 2006; Vanclay et al., 2007). Less attention has been placed on the landholders’ occupation. Race et al. (2012) initially classified landholders into two types: farmers and non-farmers based on the landholder’s self-declared occupation. Through interviews with a small number (n=29) of rural landholders, those researchers determined that the farmer / non-farmer classification was not sufficient and further divided the non-farming category into part-time farmers and lifestyle landholders. This further classification was atheoretical and based on qualitative judgments using a combination of primary occupation, property size, and income sources (on or off-farm income).

Jansujwicz et al. (2013) established a typology for landholders in relation to vernal pool conservation. The three categories of ‘supportive’, ‘uncertain’ and ‘opposing’ landowners were identified based on responses to statements exploring the perceived personal gains and losses associated with ecologically important pools of water that act as the breeding ground for invertebrates. Orsini (2013) developed a relational typology that included five landholder types based on the iterative process between land management practices and rationale of decisions by landholders. By examining the internal and external forces influencing decision-making, five groups were formed: pure farmers, land developers, amenity farmers, land-with-house owners, and house-with-land owners. In a separate study nine constructs (largely unrelated to the CIC dimensions with the exception of the behavioural involvement dimension and more peripherally the dimension of social embeddedness) were used to segment Australian landholders into two broad groups: lifestyle / hobby farmer (including ‘professional lifestylers’, ‘retiree lifestylers’, ‘and ‘blue collar lifestylers’) and farmer (‘quality operators’ and ‘traditional farmers’) (Morrison & Lockwood, 2014).
As illustrated above, many segmentation efforts and typologies exist and most employ different approaches to creation. The key findings from this review of the literature are that most existing rural landholder typologies are atheoretical and have been based on variables largely unrelated to occupation. In many instances the typologies developed are unlikely to be relevant to a wider range of contexts. Moreover, as Emtage et al. (2006) illustrated, there has been limited attention to the non-farming cohort of landholders despite evidence that farming and non-farming identities are likely to be significant influences on land use and management in multifunctional landscapes (Curtis & Mendham, 2011).

**Landholder land management practices**

Australia faces mounting environmental problems that have a direct affect on the agricultural industries and the communities that rely on them. As found in Maybery et al. (2005), the most pressing, extensive and expanding environmental issues include the indications of salinity in both dryland and irrigated areas, the precipitous acidification of agricultural soils and pervasive biodiversity decline. A Natural Resource Management Investment Report on the Murray-Darling Basin predicted the repair and prevention costs of environmental degradation to surmount $65 billion over a 10 year period (Madden & Hayes, 2000). Changing the management practices of Australian landholders is essential to the health and vibrancy of the Australian environment. Barr (2002) views the present rate of land management change to be inadequate. A concise effort to target landholders to change to current recommended practices is essential in stopping and correcting this downward spiral that the Australian landscape seems to be facing. Extension agents, Land Trusts and other landcare groups need to identify and work hard to actively engage these individuals to change their landcare practices.

Landholder behaviour is the focus of much research. A number of theories (e.g. Value-Belief-Norm Theory and Theory of Planned Behaviour) have been used to explore landholder behaviour. In some cases researchers focus on either the farming or non-farming cohort, while others study both but crudely separate the two. In an increasingly fragmented countryside where non-farmers coexist and occupy the same landscape as farmers, previous items used to separate landholders focusing on the farming landholder cohort do not apply to those who do not hold that agricultural
productive focus (e.g. Marshall et al., 2012; Primdahl & Kristensen, 2011). Similarly, those that only focus on the non-farmers and omit the farming landholders (e.g. Gill et al., 2010) are not appropriate. While each new study adds depth to the landholder profile that exist in an area or a particular context, one underlying thread between all landholders is an occupational identity. Examining how a farmer identity influences their land management practices creates a uniform approach applicable to a range of landholders allowing for a direct comparison across contexts.

**Use of theory in predicting behaviour**

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) has been used to predict social behaviours. At the core of this theory is the underlying foundation that an individual’s intentions to engage in a behaviour will determine their ultimate behaviour. TPB creates a framework for understanding and indeed predicting human behaviour. Accordingly, three broad components can predict behavioural intentions: attitudes (the overall positive or negative evaluation of conducting the behaviour), subjective norms (the evaluation of how people of importance in an individuals’ life would want them to perform), and perceived behavioural control (perceived extent of personal control over behaviour). The integration of social identity concepts and group norms into TPB (Hogg & Terry, 2000; Hogg, et al., 1995) illustrate the complexity and evolving nature of the methods for behavioural prediction. What was once a relatively straightforward model of predicting behaviour is now contextually dependent upon social groups, identification and expected behaviours.

Fielding, Terry, et al. (2008b) conducted a study on horticulturalists in Queensland, Australia integrating TPB and social identity concepts with a specific focus on the sustainable NRM practice of riparian zone management. In that study the importance of ‘behaviourally relevant reference groups’ (e.g. other farmers or non-farmers) and their expectations were important. The Queensland landholders who perceived the norms of other landholders to be supportive of riparian zone management were more likely to engage in this behaviour as well.

In line with other researchers employing TPB to predict behaviour, Sutherland and Holstead (2014) utilised TPB to explore the uptake of renewable energy production on agricultural land in Scotland. Diversifying the farm's economic resources increased the
long-term viability of the farm. The farmers exhibited perceived behavioural control through the way they approached wind turbine development (e.g. renting the land to developers or reducing the size of the wind turbine). Pro-environmental behaviour was the focus of Hinds and Sparks (2008) study utilising TPB regarding university students. Those authors found that affective connection to the natural environment was a significant predictor of intentions to engage with the natural world. Bonding with nature is found to be a significant predictor of behaviour in other studies as well.

Value-Belief-Norm (VBN) theory is a chain of five variables leading to environmental behaviour (Stern, 2000). The causal chain of VBN begins with values (i.e. biospheric, altruistic and egoistic), which are relatively stable and central elements of an individual’s belief structure and personality, and advances to beliefs (an opinion or conviction) of the human-environment connection. Norms, farther down the chain, are activated by the preceding beliefs. VBN theory, “postulates that the consequences that matter in activating personal norms are adverse consequences to whatever the individual values” (Stern, 2000, p. 413). As an example, individuals who highly value other species will be concerned with environmental conditions that threaten those species and those who care for others will be concerned about environmental conditions that may affect their health or well-being. The feeling of a moral obligation activates the personal norm to behave in a certain way.

However, psychological motivation by itself does not ensure that an environmentally significant behaviour will be enacted. Johansson et al. (2012) found in their study of farmland and forest landowners that other variables including education, property size and length of ownership contributed to landholder behaviour. Raymond et al. (2011) utilised VBN items and place attachment in two agricultural regions in South Australia. Based on their findings, the authors expressed reservations about the sole reliance on values, beliefs and norms to explain the intention to engage in a behaviour. That is not to say that social norms do not have a place in the analysis of land management behaviour. Social norms were found to influence newer landholders and that these new landholders also helped create new norms of land management behaviour in another part of Australia (Minato et al., 2010).
Agreement with land management strategies alone does not necessarily indicate land management practice implementation will occur (Waudby et al., 2012). External factors, including lack of financial capacity, often limit the engagement of a practice (Holmes & Day, 1995), however the adoption of certain program practices (e.g. conservation measures) does not solely rely on program incentives (Schaible et al., 2015). As exhibited in the literature, the decision-making process is not one that is clear-cut with one contributing factor to consider.

Burton (2004a) called for greater use of psychological constructs, including self-identity, in the study of decision-making processes of farmers. Zollinger and Krannich (2002) conducted exploratory research to analyse factors influencing farmers to sell productive farm land to be used in urban expansion. Two perceptions were found to be statistically significant in the study site of four counties in Northern Utah. The first is a perceived negative change to operation from increased non-agricultural land use in the area which leads to a high dissatisfaction with the area as a place to farm (i.e. increased traffic makes it harder to get around on roads or the increase in complaints from new neighbours offended by farm smells and noise). The perceived difficulty in renting/purchasing agricultural land leads to high expectations that the operation will become unviable and, subsequently, a high expectation to sell some or all of the operation for non-agricultural use. In addition, a lack of a child to take over the operation / lack of a successor and low profitability of the operation leads to high expectation to sell some or all of the operation for non-agricultural use. Following the work of Kuehne, Bjornlund and Cheers (2008) those individuals with high expectations to sell some or all of their land at some point in time would most generally fall into the investor or lifestylers category. The providers tended to more strongly believe / value keeping the land that they own to pass on to future generations. With the change of rural landscapes there are benefits (increase in biodiversity, protectionist intuitions, etc.) as well as costs (invasive species introduction, prescribed fires no longer an option, etc.) to be considered when gaining a holistic view of what an in-migration of new owners means to a particular community and ecosystem (Abrams et al., 2012).

A limited number of agricultural studies focused on behaviour have directly measured identity constructs (e.g. Burton & Wilson, 2006; Seabrook & Higgins, 1988), with the exception of the multitude of studies examining the identity of women in agriculture
(e.g. Brandth, 2002; Brasier et al., 2014). Other research efforts have focused on a certain aspect of identity, such as the internalisation of the farming role (e.g. Burgess, Clark, & Harrison, 2000). Williams et al. (1994) and an Allison (1996) study each focused on community forestry and each separately identified self-identification as influencing responses to their respective questionnaires. Burgess, et al. (2000) found that the strength of a farmer identity accounted for some resistance to a wetland agri-environmental scheme.

The change or resistance to landscape modification can be viewed through rural landholder identity as well. The increasing number of absentee landowners and a decrease in the number of individuals managing the land could lead to landscape homogenisation (Orsini, 2013). This homogenisation of agricultural land is not only detrimental to wildlife, as there is not the variety of food sources, but it is also creating major changes in the rural landscape. A single, or a couple of farmers, who are farming large tracts of land in less than desirable ways leads to major repercussions with the larger community. Seabrook et al. (2008) found that a number of variables (e.g. property size, shelter for crops, training, and native vegetation attractiveness) explained why farmers retained trees on their property. Property size had the largest effect size.

The examination of pastoralists’ identity and connection to the land provides a historical context for the importance of values and the consequent land management decisions (Holmes & Day, 1995; Holmes, 1986), while the exploration of strategies of farmer-driven, not farmer adoption, innovation in an Australian context highlights the need to examine farmers’ land management practices in depth (McKenzie, 2013). McKenzie (2013) identified seven strategies that drive farmer driven innovation. The first of which is observing signals from the landscape and (re)acting accordingly. Conducting independent tests and trials on the farm proved useful to solving unique farm problems. Redesigning farm layout and increasing system flexibility to account for the amount of risk involved in innovation are yet two more strategies that farmers implement. Seeking advice from a consultant, within a farmer group or within new arenas are three ways that farmers seek and exchange land management practice innovation.
Conclusion

This chapter began by outlining the multifunctional landscape that is occurring in Australia and the United States and the resulting mix of landholders. The non-farmer cohort has received little attention in the literature, with a low emphasis placed on landholder occupation. This is an important research gap given that greater areas will experience rural transition and will be faced with competing values, goals, and land uses.

The chapter then outlined the theoretically sound, multi-dimensional collective identity construct (CIC). Increasing communication technology, wealthy retirees, flexible work-week, and urban expansion are all exerting influence on rural areas close to large urban centres. This restructuring in the agricultural landscape puts increasing pressure and greater importance on correctly classifying and engaging the greater mix of landholders as each landholder cohort has different land motivations for owning property and will implement different land management practices to differing degrees (Gosnell et al., 2007; Yung & Belsky, 2007). Non-farmers may express a greater interest in the aesthetic, recreation or conservation values (Bohnet et al., 2003) as opposed to farmers who are more production focused (Emtage & Herbohn, 2008).

The research reviewed here suggests that the inconsistent use of theory and items used in typology creation is problematic for researchers and NRM officials looking to compare landholders on a larger scale. In reviewing the numerous theories utilised in identity formation, the collective identity construct as proposed by Ashmore et al. (2004) was identified as being a useful heuristic to study the influence of a farmer occupational identity across the range of landholders in a rural setting. The construct encompasses seven dimensions of a collective identity (self-categorisation, evaluation, importance, attachment and sense of interdependence, behavioural involvement, content and meaning, and social embeddedness). This construct employs a greater variety of items than has been used in previous efforts to classify landholders. The foundational underpinning important to the CIC was explored highlighting the multiple theories comprising the seven CIC dimensions. I then explored the efforts used to classify landholders and the theory utilised to predict landholder behaviour. This chapter has showcased several important gaps in Australian and international landholder occupation research. The following chapter explains the methodology used...
to explore the key research questions identified from the review of the literature presented in this chapter.
CHAPTER 3 METHODS

Introduction

The foundation of any good research rests upon the stance of the researcher and the methods employed in obtaining appropriate information to achieve the purpose of the project. This chapter provides an overview of the paradigm, methodology and methods employed before discussing how they were used to address the research questions identified from a review of the relevant literature. This chapter then describes the research design, data collection and analysis for both the qualitative and quantitative aspects of this research. The chapter concludes with a short discussion on reliability and validity, challenges and the ethical considerations of this research.

Research paradigms & methodology

This research adopts a pragmatic, mixed methods approach with the research questions considered to be the most important aspect guiding development of the research process. The theoretical underpinnings of interpretivism and positivism frameworks are also drawn upon; however, the ontological, epistemological and methodological stances remain heavily influenced by the pragmatic framework. The specific definitions or conceptual areas addressed by such terms can be confusing as many research texts interchange labels as well as definitions of these terms (Glesne, 2011). For the purpose of this thesis, ontology refers to ‘the nature of reality’; epistemology as ‘the relationship between the researcher and the researched’; methodology as ‘the process of research’; and methods as ‘the technique used to gather and analyse’ those data (Creswell & Plano Clark, 2007).

Pragmatism

Pragmatism is a ‘theory of truth’ that is reliant upon experience and interactions in society that lead to consequences and meanings (Denzin & Lincoln, 2013). It is through interpretation that meaning is assigned and ‘truth’ is achieved. In short, the ontological stance of pragmatism is that of both singular and multiple realities (both objective and subjective), the epistemology is that of practicality (employing what works), while the methodology may employ a combination of quantitative and qualitative means (Creswell & Plano Clark, 2007).
In pragmatism, the research question takes precedence over the method or the philosophical worldview (Creswell & Plano Clark, 2007). Instead of focusing on the methods, “researchers emphasise the research problem and use all approaches available to understand the problem” (Creswell, 2009, p. 10). Morgan (2007) states, "the pragmatic approach ... rejects the need to choose between a pair of extremes [context and generality] where research results are either completely specific to a particular context or an instance of some more generalized set of principles" (p. 72). Pragmatism has epistemological and methodological flexibility and advocates for the use of mixed methods to address research inquiries (Creswell & Plano Clark, 2007; Tashakkori & Teddlie, 2010).

Pragmatism has slight influences from the interpretivist and postpositivist stances. The paradigm of postpositivism is one that employs a singular reality (ontology), objectivity by researchers collecting data (epistemology) and deductive reasoning testing a priori theory (methodology) (Creswell & Plano Clark, 2007) in which the central purpose of conducting research is ‘prediction’ (Glesne, 2011). The paradigm of interpretivism, sometimes labelled as constructivism among other labels, has the central purpose of ‘understanding.’ One of the research methodologies associated with this is symbolic interactionism (the basis of many identity theories) (Glesne, 2011). Constructivism assumes there are multiple realities/perspectives (ontology), the researcher is ‘close’ to the research participants (epistemology) and employs inductive reasoning in which observations are used to create patterns or theories (Creswell & Plano Clark, 2007). Pragmatism allows for fluidity in the research stance and research process crossing and incorporating the boundaries of interpretivism and postpositivism, and was heavily relied upon in this investigation.

**Pragmatism and mixed methods**

Pragmatic researchers tend to view research as a holistic endeavour and are inclined to discount the potential dichotomy of qualitative or quantitative research (Onwuegbuzie & Leech, 2005). Onwuegbuzie and Leech (2005) advocate for the importance of learning and appreciating both qualitative and quantitative research and not positioning oneself in one camp or the other. The authors argue that instead of sitting on polar opposites of the spectrum, the qualitative/quantitative dichotomy is
on an interactive continuum in which theory is central. For qualitative researchers the aim is to build and develop, while for quantitative researchers it is to confirm and/or modify existing theory; neither is independent of the other. Smith (1975) would advocate for a blend of qualitative and quantitative analysis as “qualitative analysis deals with the forms and antecedent-consequent patterns of form, while quantitative analysis deals with duration and frequency of form” (p. 218). These two methodologies are not isolated and instead are part of a holistic, interactive and unifying process (Onwuegbuzie & Leech, 2005).

The pragmatic approach relies on abductive reasoning, which is a combination of induction and deduction drawing from both specific, context-dependent situations and theory to inform the research process (Morgan, 2007). Babbie (2011) describes induction as a process of generating principles from specific observations and deduction as the process of imploring theoretically sound ideas to test their applicability to specific situations. Deduction “begins with ‘why’ and moves to ‘whether,’ whereas induction moves in the opposite direction” (Babbie, 2011, p. 23) – reaffirming the interactive process that is pragmatism. These two approaches highlight the bidirectional nature inherent of the pragmatic approach.

Research design: A mixed methods approach

Mixed methods research is an approach to inquiry that combines both qualitative and quantitative forms of research to answer complex questions (Creswell, 2009). Creswell and Plano Clark (2007) define mixed methods research as,

“...a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analysing, and mixing both quantitative and qualitative data in the single study or series of studies. Its central promise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone” (p. 5).
There is a lack of a common definition of mixed methods. Creswell (2013b) views this as problematic, as definitions can range from focusing on mixed methods as a methodology (e.g. a system of methods) to focusing on mixed methods as a method (e.g. a particular procedure). However, researchers have identified core elements that characterise mixed methods research. Creswell (2013a) identified five core characteristics of mixed methods:

- “collects and analyses persuasively and rigorously both qualitative and quantitative data...;”
- mixes (or integrates or links) the two forms of data concurrently by combining them (or merging them), or sequentially by having one build on the other, and in a way that gives priority to one or to both;
- uses these procedures in a single study or in multiple phases of a program of study;
- frames these procedures within philosophical worldviews and a theoretical lens; and
- combines the procedures into specific research designs that direct the plan for conducting the study” (p. 106).

A mixed methods approach allows for a greater collective understanding of a topic of interest. Key strengths of the implementation of a qualitative approach include the capacity to obtain multiple perspectives on a given topic and the ability to explore the impact of context on an individual. Qualitative approaches allow researchers to explore topics in depth with participants, while quantitative research allows a researcher to cover the breadth of a topic, both of which allow for identifying unexpected relationships in different ways.

Social researchers “who limit themselves to a single method, survey or other, severely limit their ability to understand the world around them” (Babbie, 1990, p. 27). By combining qualitative (e.g. semi-structured interviews) and quantitative (e.g. mail surveys) research methods, a researcher is able to benefit from the strengths of each approach and offset some of the limitations of both approaches. By acknowledging that all methods have limitations, implementing a mixed methods approach could “neutralize or cancel the biases of other methods” (Creswell, 2009, p. 14).
Research design

Key research questions

Three key research questions form the basis of this research, which is focused on the extent a collective identity construct can be used to both classify and compare various types of landholders and identify the connection between a farmer occupational identity and land management practices.

1. Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?
   A. Can the CIC distinguish between farmers, part-time farmers with larger rural properties and non-farmers with small/lifestyle properties?
   B. Is the CIC able to distinguish rural landholders in different contexts (i.e. different countries)?
   C. Do the seven dimensions of CIC form a valid and reliable scale to measure a farmer occupational identity (OI) amongst rural landholders? Are some dimensions of CIC better predictors of a farmer OI amongst rural landholders?

2. Can an OI scale based on CIC be used to provide a theory based typology of rural landholders?

3. What is the nature of the relationship of the farmer component of personal identity and behaviour?

An overview of my research approach

A mixed methods approach allows for breadth and depth of a topic to be achieved. In this research, interviews (n=40) and a postal survey (n=1,939, response rate 48.3%) are used to answer my research questions.

Table 10 shows an approximate break down and how each method was used to answer each research question. Each data collection instrument is explained more in the following sections.

Data analysis and interpretation of findings occurred consecutively throughout the process as the findings of both methods were necessary in answering the research
questions. The reflexive nature of this process informed subsequent stages in the research. That is, initial qualitative findings informed the quantitative data stage. The interviews allowed for the Collective Identity Construct (CIC) dimensions to be tested for applicability and relevance among various landholders in addition to testing the best way to approach landholders regarding the seven dimensions. While the qualitative stage largely informs research question 1B [Table 10], the qualitative aspect of this research assists in answering each of the proposed research questions [see Table 10]. Likewise, the quantitative aspect of this research largely informs each of the research questions.
### Table 10 Mixed method implementation to answer research questions

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Analysis</th>
<th>Method*</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Qualitative</strong></td>
<td><strong>Qual</strong></td>
<td><strong>Quan</strong></td>
</tr>
<tr>
<td><strong>1A.</strong> Can the CIC distinguish between farmers, part-time farmers with larger rural properties and non-farmers with small/lifestyle properties?</td>
<td>Separation of interviewees into farmers, part-time farmers &amp; non-farmers and comparing/contrasting the 7 CIC dimensions</td>
<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td><strong>1B.</strong> Is the CIC able to distinguish rural landholders in different contexts (i.e. different countries)?</td>
<td>The comparison of CIC applicability to landholders as found in the US is compared to landholders in AU</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>1C.</strong> Do the seven dimensions of CIC form a valid and reliable scale to measure a farmer occupational identity (OI) amongst rural landholders?</td>
<td>Rating of appropriateness of each dimension to landholders as found in the interviews</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>Question</td>
<td>Methodology Description</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>1. Are some dimensions of CIC better predictors of a farmer OI amongst rural landholders?</td>
<td>Interview analysis provide support to the quantitative analysis and illustrate the utility of the CIC</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>2. Can an OI scale based on CIC be used to provide a theory based typology of rural landholders?</td>
<td>Cluster analysis coupled with tests of reliability using the CIC scale (e.g. Cronbach’s alpha) explore the capacity of CIC to develop a theory-driven typology based upon the developed collective occupational identity construct (COIC) score</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>3. What is the nature of the relationship of the farmer component of personal identity and behaviour?</td>
<td>Interviewee quotes are used to support the findings in the quantitative analysis</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>Use of COIC scores and values, beliefs, norms, attitudes, information source, and experience to test for relationships between farmer components and behaviour using a general linear model</td>
<td>20%</td>
<td>80%</td>
<td></td>
</tr>
</tbody>
</table>

*Percentages were determined through discussion and consultation with my supervisory team.*
Timing of data collection, analysis and interpretation

Table 11 illustrates the timing of the data collection phases. Development of the conceptual framework, data analysis, interpretation and integration occurred in an iterative manner throughout the process. An initial literature review provided the conceptual framework with further review and refinement throughout the process. The timing of some of the data collected within this study was, to some extent, outside of my control as I was reliant upon the support of outside agencies. Achieving a useable ratepayer list to mail out the survey was dependent on the collaboration and cooperation of the local government areas. The qualitative data collection stage was timed to avoid conflicting with the peak of crop harvest or sowing times. A thorough explanation of each stage can be found in the following sections.
<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Data collection stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>June - August</td>
<td>20 US interviews conducted (5 FTF, 10 PTF, 5 NF) in Wayne County, Ohio</td>
</tr>
<tr>
<td></td>
<td>July - December</td>
<td>USA interview transcription</td>
</tr>
<tr>
<td>2013-2014</td>
<td>November - February</td>
<td>USA interviews coded and initial analysis</td>
</tr>
<tr>
<td></td>
<td>October - January</td>
<td>Initial survey questions developed and revised</td>
</tr>
<tr>
<td></td>
<td>November - March</td>
<td>20 AU interviews conducted (5 FTF, 10 PTF, 5 NF) in Shire of Campaspe, Victoria</td>
</tr>
<tr>
<td>2014</td>
<td>February - March</td>
<td>Pilot testing of draft survey questions conducted and revision of survey questions</td>
</tr>
<tr>
<td></td>
<td>February - April</td>
<td>AU interview transcription</td>
</tr>
<tr>
<td></td>
<td>March - April</td>
<td>AU interviews coded and initial analysis</td>
</tr>
<tr>
<td></td>
<td>April - June</td>
<td>Comparison of USA and AU case studies</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>Finalising of survey questions and survey mail-out to 2,000 respondents within the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North Central Catchment Management Authority region</td>
</tr>
<tr>
<td>2014 - 2015</td>
<td>October - May</td>
<td>Survey data received and analysed - overall response rate of 48.3% (n=794)</td>
</tr>
</tbody>
</table>

Note: United States (USA), Australia (AU), Full-time farmer (FTF), part-time farmer (PTF), non-farmer (NF)
Qualitative data

The qualitative portion of this research informed each of the three research questions:

**RQ1** – Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?

**RQ2** - Can an OI scale based on CIC be used to provide a theory based typology of rural landholders?

**RQ3** - What is the nature of the relationship of the farmer component of personal identity and behaviour?

The qualitative data largely answers research question one asking if the CIC is able to distinguish between full-time farmers, part-time farmers and non-farmers in different contexts (i.e. different countries). This section identifies information related to the qualitative data obtained in this research including explanation of the study sites, informant selection, interview data collection and the analysis process.

**Study sites**

Two locales were selected for the qualitative portion of this study, one in the United States (USA) and one in Australia (AU), to enable comparisons of CIC utility across locations. The USA locale was chosen for a number of reasons. First and foremost Ohio was chosen as The Ohio State University is the location of one of my co-supervisors and conducting research within the state allowed for contacts to be utilized and for easier access to potential participants. Wayne County, Ohio was selected as this was an area that was not dominated by fracking as is many locales within Ohio. The presence of fracking may have skewed interview responses and would not be applicable or replicable in the Australian context. Wayne County exhibited a rural landscape with a mix of landholders. The AU study site was chosen as the research team (including two of my advisors) at Charles Sturt University were contracted to survey rural landholders in the North Central region. This provided the opportunity to include complementary questions on the planned survey and expand my planned data collection efforts. The two sites selected were similar in important ways (e.g. developed economies with a diversity of landholders and industry), but were also
different in other ways (e.g. climate, relative importance of religion, age, intergenerational succession), providing a good test of the relevance of the different elements of the CIC scale in each context.

**Wayne County, Ohio, United States site selection**

The United States study site is located in the Midwestern state of Ohio. Informants were from Wayne County, located approximately 60 miles (97 km) southwest of the city of Cleveland. The city of Wooster is in the middle of the 555 square mile (1440 square km) area [Map 3] and provided a base for my research activities. In 2013, Wayne County had a total estimated population of 115,071 (U.S. Census Bureau, 2014). Wayne County was named as the ‘Top Micropolitan Area in the U.S.’ for business attraction and expansion (Wayne Economic Development Council, 2014) which speaks to the diversity of landholders and occupations in the area.

![Map 3 United States Study Site - Wayne County, Ohio](image)

Wayne County is home to the world headquarters for JM Smucker Co. (a food manufacturer) and has an active food processing cluster including industry leaders of Smuckers, Pepsico, and Land O’ Lakes (Wayne Economic Development Council, 2014). Major industries include education, health care and manufacturing. While agriculture and other primary industries account for a small proportion of total employment.
(4.2%) (U. S. Census Bureau, 2012), rolling farmland accounts for 76% of all available land in the county [Image 1] (United States Department of Agriculture, 2014). Wooster receives on average 40 inches (1019 millimetres) of rainfall and 30 inches (762 mms) of snow per year (Your Weather Service, 2014). Wayne County ranks first in milk, cattle and calves, oats and hay in terms of cash receipts for all Ohio counties (Department of Agricultural, 2012). In fact, Wayne County has the third largest agricultural economy in all of Ohio and is recognized as the top dairy producing county in the state [Image 2] (Wayne Economic Development Council, 2014). Much of Ohio experienced drought-like conditions in 2012 and may have impacted responses in the interviews conducted.
Shire of Campaspe, Victoria, Australia site selection

The study site of the Shire of Campaspe is part of the North Central region in the state of Victoria in south eastern Australia [Map 4] and is similar to the USA context in terms of variability in rural landholders and tourist influence, while being within commuting distance to a larger city as found in the USA. Study participants lived near the township of Echuca, the largest urban area in the Shire, located on the iconic Murray River. The local government area surrounding Echuca covers an area of 1,747 square miles (4,526 square kilometres), and has a population of 37,769. Echuca is within daily commuting distance to the larger centre of Bendigo (56 miles/90 kms) and 112 miles (180 kms) north of the city of Melbourne with main industries of dairying, tourism and cropping.
Agriculture employs 13% of the work force with 88% of land dedicated to production (Australian Bureau of Statistics, 2014). In addition to agriculture, Echuca has a substantial tourism industry – being recognized as home to the largest riverboat fleet in the world and is known as Australia’s Paddlestreamer Capital (Design Experts, 2011). The area surrounding Echuca receives on average 17 inches (428 mm) of rainfall (Australian Government Bureau of Meterology, 2014). South east Australia experienced a “Millennium Drought” in 2001-2009 which is recorded as the worst drought on record for the region (van Dijk et al., 2013). Data collected represented opinions coming out of a decade of drought, which may have influenced how some individuals answered certain questions (i.e., ‘In general, I’m glad that I’m an agricultural producer’). Agriculture is the predominant land use in the Shire with most of that land irrigated - visually defined by the irrigation and drainage channels network [Image 3 & Image 4] (Shire of Campaspe, 2012).
Data collection and analysis

Semi-structured interviews were conducted in summer 2013 in the United States and in the summer 2014 in Australia. Interviews were conducted with a total of forty landholders, including 20 in Australia and 20 in the United States.

The interviews indicated the applicability and relevance of the CIC dimensions for the different categories of landholders. For instance, the interviews and analysis led to
initial hypotheses that only some of the elements of the ‘content and meaning’
dimension of the CIC scale were relevant to the entire cohort of landholders, while
other elements were largely inapplicable across the landholder cohorts. Indeed,
Ashmore, et al. (2004) state that the CIC dimension ‘content and meaning’ has only
成功fully been employed in qualitative form and attempts to quantitatively explore
this dimension have been unsuccessful. The qualitative research was useful in that it
allowed me to identify those core elements to include in further analysis during the
subsequent quantitative phase of research.

Informant selection

The first stage of this research entailed interviewing a subset of different rural
landholders. The three groups of interest included 1) landowners who were non-
farmers focused on amenities rather than production, 2) part-time farmers who were
focused on production of food and fibre and also receive the majority of their income
from other forms of employment, and 3) full-time farmers who spent the majority of
their efforts and earn the majority of their income from their farming activities [Table
12]. The selection of these three groups was expected to ensure a broad perspective
of how the collective farmer identity influenced rural landscape management and
change (research question three) and also answers research question one (Can the CIC
distinguish between full-time farmers, part-time farmers, and non-farmers?). Three
types of landholders were selected as we expected that there was an important cohort
of famers (e.g. part-time farmers) that were neither fully considered (and fit our
descriptions of) either non-farmer or full-time farmer. I interviewed five non-farmers,
ten part-time farmers, and five full-time farmers in each location as previous research
has separated landholders into the dichotomy of famers/non-farmers, with less
attention paid to those individuals who straddle the middle.

In each location, I contacted locally relevant organizations to identify initial study
participants. Those organizations included the Ohio Farm Bureau and the Geographic
Information Systems (GIS) Department in the USA study location and the North Central
Catchment Management Authority and The Echuca-Moama Rotary Club in Australia. A
small number of individuals were initially chosen as interviewees with direction from
the research team and local organizations as I had no existing contacts in the
designated areas. The remaining interviewees were identified utilizing the purposive snowball sampling technique.

**Table 12 Landholder cohort defining characteristics**

<table>
<thead>
<tr>
<th>Landholder cohort:</th>
<th>Defining characteristics:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-farmer</strong></td>
<td>Are interested/focused on the amenity value of their property and have no/lower interest in production of food/fibre</td>
</tr>
<tr>
<td><strong>Part-time farmer</strong></td>
<td>Farm part of their work week and have an off-property income of greater than their on-property income and have a higher interest in production rather than in the amenity values that the land offers</td>
</tr>
<tr>
<td><strong>Full-time farmer</strong></td>
<td>Farm full time (on-property income exceeds off-property income).</td>
</tr>
</tbody>
</table>

a. Adapted from landholder characteristics identified in the literature review chapter.

In both locations I contacted participants via telephone to inquire if they would like to participate in the interviews. The purpose of the research, interview process, and estimated time commitment was explained before a suitable time and place was organized if the landholder agreed to participate. Most interviewees had been alerted preceding my initial contact from prior interviewees and were aware of my project which generally resulted in a high response rate to my request for an interview. Interviewees were not selected solely on their willingness to participate, but instead the decision for inclusion was based upon the criteria in obtaining a diverse set of landholders. These individuals had to be local landholders who owned at least 10 acres with various commitments to farming activities. The participants were provided with consent and information sheets prior to the interview stating the purpose, process and outcomes of this research explained again before receiving informed consent. The majority of interviews were conducted in the participants’ home, which reduced anxiety and provided context for the information shared.

In the USA, contact was first made with the Ohio Farm Bureau organization and my request to be put in touch with landholders in the area was fulfilled. I was initially provided three names of full-time farmers willing to participate. Initially, landholders
who did not readily identify as farmers (i.e. non-farmers) were not being identified through the snowball sampling process in the US. Accordingly, the GIS department in Wayne County was contacted and a list of those individuals owning greater than 10 acres and deemed as ‘non-agriculture’ were identified. Sixty-eight landowners were identified in two townships within Wayne County. A letter of introduction was sent out in late June 2013 to 20 randomly selected landowners with two individuals responding and subsequently interviewed. The remaining landowners in this category were found via snowball sampling. Thank you letters to all US interviewees were sent out in early August 2013. There were two individuals who I was not able to meet in my time frame in the study site and a phone interview was conducted in place of a face-to-face interview.

In the Australian location, initial contact was made with the North Central Catchment Management Authority to request names of landholders in the area to start the interview process. No names were provided and so contact was made with the local Rotary, Tourism Board and Lions Club in Rochester and Echuca. Through the use of help of members in the Rotary Club, the initial four interviews were obtained. In addition, another individual was identified by someone who used to work on the irrigation channels in the area. Purposive snowball sampling helped to fulfil the remaining 16 interviews. The interviews in Australia were spread over a greater time period than in the USA to accommodate the time constraints of the participants and is also a reflection that I was not ‘based’ in the study area during the time of interviewing as was the case in the US. There were two individuals who I was not able to meet in my time frame in the study site and a phone interview was conducted in place of a face-to-face interview. Table 13 and Table 14 provide details of the interviewees. Land use, primary occupation, income, and time spent on the property are suitably comparable, but there are some differences in age between both locations. In some instances a married couple participated in the interview; both sets of comments were transcribed and the interview was considered a single interview.
<table>
<thead>
<tr>
<th>Occupation</th>
<th>Age</th>
<th>Sex</th>
<th>Acres owned</th>
<th>Primary land use(s)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy farmer</td>
<td>36</td>
<td>M</td>
<td>500</td>
<td>Grain</td>
<td>Ohio</td>
</tr>
<tr>
<td>Organic dairy farmer</td>
<td>55</td>
<td>M</td>
<td>280</td>
<td>Pasture &amp; crops</td>
<td>Ohio</td>
</tr>
<tr>
<td>Hog farmer</td>
<td>50</td>
<td>M</td>
<td>2500</td>
<td>Grain &amp; hogs</td>
<td>Ohio</td>
</tr>
<tr>
<td>Dairy farmer</td>
<td>47</td>
<td>M</td>
<td>700</td>
<td>Dairy &amp; crops</td>
<td>Ohio</td>
</tr>
<tr>
<td>Crop farmer</td>
<td>47</td>
<td>M</td>
<td>400</td>
<td>Cattle &amp; crops</td>
<td>Ohio</td>
</tr>
<tr>
<td>Heating / cooling</td>
<td>50</td>
<td>M/F</td>
<td>11</td>
<td>Creek &amp; yard</td>
<td>Ohio</td>
</tr>
<tr>
<td>Retiree - heavy equipment operator</td>
<td>70</td>
<td>M</td>
<td>129</td>
<td>Pasture, hay, sheep &amp; beef cattle</td>
<td>Ohio</td>
</tr>
<tr>
<td>Admin assistant / wealth manager</td>
<td>63 &amp; 64</td>
<td>F/M</td>
<td>25</td>
<td>Leased out</td>
<td>Ohio</td>
</tr>
<tr>
<td>Rubbermaid retiree</td>
<td>70+</td>
<td>M/F</td>
<td>17</td>
<td>Woods &amp; rented out</td>
<td>Ohio</td>
</tr>
<tr>
<td>Retiree - Xerox</td>
<td>70</td>
<td>M</td>
<td>22</td>
<td>Woods</td>
<td>Ohio</td>
</tr>
<tr>
<td>Part-time road commission</td>
<td>57</td>
<td>M</td>
<td>27.5</td>
<td>Crops, pasture &amp; sweet corn</td>
<td>Ohio</td>
</tr>
<tr>
<td>Excavator operator</td>
<td>47</td>
<td>M</td>
<td>20</td>
<td>Corn &amp; soybeans</td>
<td>Ohio</td>
</tr>
<tr>
<td>Firefighter</td>
<td>41</td>
<td>M</td>
<td>50</td>
<td>Pasture &amp; crops</td>
<td>Ohio</td>
</tr>
<tr>
<td>Environmental health and safety manager</td>
<td>44</td>
<td>M</td>
<td>129</td>
<td>Pasture &amp; timber</td>
<td>Ohio</td>
</tr>
<tr>
<td>Medical (ultrasound and firefighter/paramedic)</td>
<td>34 &amp; 29</td>
<td>M/F</td>
<td>45</td>
<td>Woods, leased &amp; veggie patch</td>
<td>Ohio</td>
</tr>
<tr>
<td>Job Description</td>
<td>Age</td>
<td>Gender</td>
<td>Income</td>
<td>Farming Activities</td>
<td>Location</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-----</td>
<td>--------</td>
<td>--------</td>
<td>---------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Banker</td>
<td>38</td>
<td>M</td>
<td>12</td>
<td>Beef cattle &amp; grain</td>
<td>Ohio</td>
</tr>
<tr>
<td>University employee, farmer, niche marketer</td>
<td>63</td>
<td>M</td>
<td>100</td>
<td>Pasture, woods &amp; crops</td>
<td>Ohio</td>
</tr>
<tr>
<td>University employee, farmer, niche marketer</td>
<td>58</td>
<td>F</td>
<td>14</td>
<td>Sheep &amp; pasture</td>
<td>Ohio</td>
</tr>
<tr>
<td>Trucking transportation</td>
<td>54</td>
<td>M</td>
<td>400</td>
<td>Timber, cattle, pasture &amp; hay</td>
<td>Ohio</td>
</tr>
<tr>
<td>Road commission</td>
<td>38</td>
<td>M</td>
<td>10</td>
<td>Grain &amp; hay</td>
<td>Ohio</td>
</tr>
<tr>
<td>Retiree - part time farmer</td>
<td>78</td>
<td>M</td>
<td>830</td>
<td>Beef cattle</td>
<td>Victoria</td>
</tr>
<tr>
<td>Part-time teacher</td>
<td>53</td>
<td>F</td>
<td>4000</td>
<td>Grain &amp; sheep</td>
<td>Victoria</td>
</tr>
<tr>
<td>School principals</td>
<td>58 &amp; 59</td>
<td>M/F</td>
<td>200</td>
<td>Cattle, plantation &amp; agistment</td>
<td>Victoria</td>
</tr>
<tr>
<td>Civil contractor/excavator &amp; homemaker</td>
<td>45</td>
<td>F/M</td>
<td>2000</td>
<td>Grain &amp; sheep</td>
<td>Victoria</td>
</tr>
<tr>
<td>Dairy &amp; beef farmer</td>
<td>58</td>
<td>M/F</td>
<td>5,000</td>
<td>Dairy, beef &amp; sheep</td>
<td>Victoria</td>
</tr>
<tr>
<td>Disability support worker</td>
<td>51</td>
<td>F</td>
<td>10</td>
<td>Sheep, beef &amp; pasture</td>
<td>Victoria</td>
</tr>
<tr>
<td>Hay, cattle</td>
<td>60</td>
<td>M</td>
<td>870</td>
<td>Hay &amp; cattle</td>
<td>Victoria</td>
</tr>
<tr>
<td>Dairy, sheep, beef</td>
<td>55</td>
<td>M</td>
<td>1000</td>
<td>Sheep &amp; beef</td>
<td>Victoria</td>
</tr>
<tr>
<td>Farming, construction, earthworks</td>
<td>53</td>
<td>M</td>
<td>3000</td>
<td>Dairy &amp; cereals</td>
<td>Victoria</td>
</tr>
<tr>
<td>Occupation</td>
<td>Age</td>
<td>Gender</td>
<td>Income</td>
<td>Details</td>
<td>Location</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----</td>
<td>--------</td>
<td>--------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Mechanic &amp; Bookkeeper</td>
<td>50 &amp; 48</td>
<td>M/F</td>
<td>15</td>
<td>Beef</td>
<td>Victoria</td>
</tr>
<tr>
<td>Dairy farmer</td>
<td>40</td>
<td>F</td>
<td>3000</td>
<td>Share farm with father-in-law; dairy cattle &amp; grain</td>
<td>Victoria</td>
</tr>
<tr>
<td>Dairy farmer</td>
<td>66 &amp; 66</td>
<td>M/F</td>
<td>93</td>
<td>Jersey dairy cattle</td>
<td>Victoria</td>
</tr>
<tr>
<td>Retired solicitor</td>
<td>77</td>
<td>M</td>
<td>10 (previously 280)</td>
<td>Pasture &amp; agist land to daughter</td>
<td>Victoria</td>
</tr>
<tr>
<td>Landscaper</td>
<td>65</td>
<td>M</td>
<td>25</td>
<td>Cattle &amp; pasture</td>
<td>Victoria</td>
</tr>
<tr>
<td>Dairy farmer</td>
<td>47</td>
<td>M</td>
<td>670</td>
<td>Dairy, lucerne, winter &amp; rye grass</td>
<td>Victoria</td>
</tr>
<tr>
<td>Cattle &amp; farm labourer</td>
<td>47</td>
<td>M</td>
<td>84</td>
<td>Cattle &amp; lucerne</td>
<td>Victoria</td>
</tr>
<tr>
<td>Cattle &amp; B&amp;B co-owner</td>
<td>60</td>
<td>M</td>
<td>500</td>
<td>Natural vegetation, crops &amp; dairy cattle on agistment</td>
<td>Victoria</td>
</tr>
<tr>
<td>Handy man &amp; children’s play group</td>
<td>41</td>
<td>M</td>
<td>12</td>
<td>alpacas</td>
<td>Victoria</td>
</tr>
<tr>
<td>Electrical contractor</td>
<td>44</td>
<td>M</td>
<td>300</td>
<td>Lucerne hay, beef cattle &amp; dairy cattle heifers</td>
<td>Victoria</td>
</tr>
</tbody>
</table>
### Table 14 Informant attributes

<table>
<thead>
<tr>
<th>Site</th>
<th>Cohort*</th>
<th>n</th>
<th>Age (range)</th>
<th>Occupation</th>
<th>Primary land use</th>
<th>Median area owned (acres)</th>
<th>Range of area owned (acres)</th>
<th>On farm income as % total (range)</th>
<th>Labour time on property (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>FTF</td>
<td>5</td>
<td>36-55</td>
<td>Dairy, hog, crop farmer</td>
<td>Crops, livestock</td>
<td>876</td>
<td>280 – 2,500</td>
<td>70%-100%</td>
<td>80%-100%</td>
</tr>
<tr>
<td>USA</td>
<td>PTF</td>
<td>10</td>
<td>29-63</td>
<td>Medical, education, transportation, finance, compliance</td>
<td>Crops, livestock, pasture, timber</td>
<td>80</td>
<td>10 - 400</td>
<td>0%-33%</td>
<td>1%-50%</td>
</tr>
<tr>
<td>USA</td>
<td>NF</td>
<td>5</td>
<td>50-70</td>
<td>Retiree, finance, repairman</td>
<td>Pasture, timber, recreation, leased</td>
<td>41</td>
<td>11 - 129</td>
<td>0%-5%</td>
<td>0%-10%</td>
</tr>
<tr>
<td>AU</td>
<td>FTF</td>
<td>5</td>
<td>40-87</td>
<td>Dairy, beef farmer</td>
<td>Crops, livestock</td>
<td>870</td>
<td>93 – 5,000</td>
<td>100%</td>
<td>70%-100%</td>
</tr>
<tr>
<td>AU</td>
<td>PTF</td>
<td>10</td>
<td>44-78</td>
<td>Retiree, education, construction, farm worker, contractor</td>
<td>Crops, livestock, pasture</td>
<td>665</td>
<td>25 – 4,000</td>
<td>7%-90%</td>
<td>10%-100%</td>
</tr>
<tr>
<td>AU</td>
<td>NF</td>
<td>5</td>
<td>41-77</td>
<td>Medical, education, law, finance</td>
<td>Livestock, pasture, leased</td>
<td>12</td>
<td>10 - 200</td>
<td>0%-12%</td>
<td>3%-60%</td>
</tr>
</tbody>
</table>

Note: A female perspective was obtained for each cohort except the USA FTF.*FTF – full-time farmers, PTF – part-time farmers, NF – non-farmers
Interview process

Using a semi-structured interview format, I explored three broad topics: the CIC dimensions; previous and current occupations; and background information. The interview guide began with the general question of participants’ current occupation, followed by the role of farming in their lives, their past occupations and general background information [Box 1].

Opening interview questions such as “What do you do for a living?” followed by either “What does it mean to be a farmer?” (for those identifying as a farmer) or “Can you describe the importance of the role of a ‘farmer’ to you?” (for those identifying as non-farmers) opened the dialogue to explore whether an individual identified as a farmer, the perceived similarity with other farmers, and the level of certainty of their fit within this social category. Follow-up questions including “Do your ‘farming’ activities reflect a typical landholder in this area?” were used to explore the degree to which their activities directly implicated them as a farmer. Additional questions such as, “Do you see the mix of part-time farmers, full-time farmers, and non-farmers/lifestyler as having a role within the rural landscape?” were used to explore how the interviewee’s thought about themselves and how they thought others viewed the collective identity of farmers.

The interview guide included general prompts and does not necessarily represent the exact way in which the questions were delivered to the interviewee. The interview was conversational in nature with the interviewee being allowed to elaborate past the boundary of the initial question as the additional context provided is very helpful in developing a richer, thicker description of the response to the question (Babbie, 2007).
Box 1 Semi-structured interview guide

**QUESTION 1.** What do you do for a living? [self-categorization]

**QUESTION 2.** The role of farming in their lives:

i. Farmer: What does it mean to be a farmer?

ii. Non-farmer: Can you describe the importance of the role of ‘farmer’ to you?

1. General probe: Can you explain that a bit more?

**Specific Collective Identity Construct Probes**

- Who are your friends? Do they all belong to the same group? [social embeddedness]
- What social groups would you consider yourself to be a part of? [self-categorization]
  - How would you and others describe that group? What is that group’s intentions? How are they viewed by both you and others? [evaluation]
  - Do you see the mix of part-time/full-time farmers/lifestylers as having a role within the rural landscape? [evaluation & importance]
    - How important are these groups to your sense of who you are? [importance]
  - What have been the most important influences on your farming practices in the past 5-10 years? [attachment and sense of interdependence]
    - How/What have you done?
    - Do you do things differently than your neighbours?
    - Do you think there is peer pressure amongst landholders in this district?
  - Do your ‘farming’ activities reflect a typical landholder in this district? [behavioural involvement; content & meaning: narrative]
- Are there traits that make a person be seen as a part of a particular landholder group? Do you consider there to be different types of landholders/farmers? [content & meaning: self-attributed characteristics]
- What is the history of [occupation], how is this group viewed by society? [content & meaning: ideology]
A more unstructured interview approach was employed during the first round of interviews in the USA to allow relevant themes to emerge on their own without prompting or influencing interviewee responses. Relatively high level questions such as ‘What does it mean to be a farmer to you?’ allowed the interviewee to determine more-or-less the depth of coverage on the topics. Some dimensions of CIC were covered and explored more than others. Some interviewees would cover the topic/dimension without prompting, but in other cases the dimension was not explored. Upon reflection, I am not confident that the topics that were not discussed during these interviews were not applicable to interviewees. It may simply have not been verbalized in response to the general questions.

Based upon the experience with these initial interviews, I modified my approach to include more specific prompts of items of interest during the second phase of interviews completed in Australia. This modification resulted in asking more direct questions and provided additional depth of discussion regarding some dimensions of the CIC construct. For example, a specific question was included to explore the dimension of ‘implicit importance’ by asking the interviewee where they would rate farming in their hierarchy of identities. I directly asked what farming meant to them and how they would feel if they were no longer able to farm the next day. After including this specific question, interviewees were able to provide more relevant
answers during the second phase of interviews. This ‘lack of coverage’ in the first round of interviews could be due to lack of experience on my part, the population that was interviewed, or a combination of the two.

All interviews were audio-recorded with permission from the participants and lasted between 30 minutes and 3.5 hours. Several interviews included a tour of the property that provided additional context and valuable information in aiding my understanding of their viewpoint.

The practice of transcription – an overview

It is one thing to conduct a successful interview but it is another to decide what to do with the interview content. There is no clear-cut procedure on how to analyse interview data. Critics on both sides of the spectrum will dispute their respective arguments on why you either would or would not want to transcribe an interview word for word. The very act of transcribing has received little attention in the literature. In empirical publications, researchers seldom mention the transcription process in detail, but only mention that data was transcribed. It is assumed that “transcriptions are transparent, directly reflecting in text the “hard reality” of the actual interaction” (Lapadat, 1999, p. 65).

Anfara et al. (2002) would argue however that the process of transcription is not public enough. Each researcher decides whether or not to transcribe and how to represent the data (Lapadat, 1999, p. 66). Transcripts in and of themselves cannot be neutral as the researcher will inherently bias the research and data through their choices. Researchers decide on what to and what not to include in their transcription and the reader is never the wiser. Transcription, like an interview itself, is inherently interpretive and contextual.

Transcription is also time consuming and can be costly. Other disadvantages to transcription include access to equipment and programs and the need for specialized training that may be required. Full transcription however offers the most comprehensive recount of the interaction, containing ‘rich descriptions’ which allow the data to be used in the future as it “preserves the data in a more permanent, retrievable, examinable, and flexible manner” (Lapadat, 1999, p. 80). Lapadat (1999)
suggests, “transcription is an essential step for applied research to achieve thoroughness, accuracy, and retrievability” (p. 78).

The practice of interview data analysis – an overview

Thematic analysis is a way to encode qualitative information allowing for patterns or themes to become visible. Coding, through the use of abduction, allow the data to be broken into large categories (Glesne, 2011) while further refinement, discussion and re-coding allow for subtle themes to come to the forefront. Thematic analysis has a number of purposes including: “a way of seeing; a way of making sense out of seemingly unrelated material; a way of analysing qualitative information; a way of systematically observing a person, an interaction, a group, a situation, an organization, or a culture; a way of converting qualitative information into quantitative data” (italics original) (Boyatzis, 1998, p. 4). This type of analysis creates a ‘bridge’ in which scholars in different fields and epistemologies are able to communicate with each other and allow for a more comprehensive understanding of a certain phenomena.

There are three distinct stages that come with the use of thematic analysis: (I) deciding on sampling and design issues, (II) developing themes and a code, and (III) validating and using the code. In the first stage, a researcher must determine what and how many of a population will be sampled and design their research instrument accordingly. Within the second stage “there are three different ways to develop a thematic code: (a) theory driven, (b) prior data or prior research driven, and (c) inductive or data driven” (Boyatzis, 1998, p. 29). Theory driven code development is the most common used approach in social science research. The researcher begins with a theory and then “formulates the signals, or indicators, of evidence that would support this theory” (Boyatzis, 1998, p. 33). It must be noted however that theory driven codes are subject to the researchers’ beliefs and assumptions and this may prove difficult to determine what the interview data may be truly saying. In the third stage it is important that the researcher double checks to ensure that consistent coding is taking place and that codes be clearly defined. While I did employ theory driven codes, I also used inductive coding which is not reliant upon presupposed codes as discussed in the following section.
There are some obstacles to conducting analysis effectively. Boyatzis (1998) states the following three issues as hurdles in data analysis; the “researchers (a) projection, (b) sampling, and (c) mood and style” (p. 12). The threat of projection lies in the researcher making assumptions about what an interviewee said or reading into what was not said that stems from the researchers own background, values and experiences. A lack of clear judgment when sampling the population of interest is another fatal flaw; a convenient sample is not necessarily a representative one. Lastly, mood and style of the researcher can be another devastating flaw in thematic analysis. When a researcher is preoccupied, fatigued or worried the coding reliability and consistency diminishes greatly. It is recommended that the researcher suspend coding and come back to the data when a new frame of mind has been reached (Boyatzis, 1998).

Transcription of interview data and abductive coding – in practice

The interviews were recorded on an RCA audio recorder. Interview dialogue was transcribed verbatim using the Nuance voice-to-text software Dragon Naturally Speaking, version 12 which placed the text into a Word document upon speaking into a microphone. As Dragon is not 100% accurate, I re-listened to the recordings and checked for inaccurate transcription and fixed any errors. Following this step, the document was imported into QSR International NVivo 10 and the coding process began. The first step was to confirm that each person in a case study was properly classified as FTF, PTF and NF on the basis of the previous definitions [Table 12]. Since interview questions largely followed the outline of the seven CIC dimensions, deductive coding was primarily implemented by following the definitions presented in Ashmore, et al. (2004). I coded each transcript paragraph-by-paragraph using largely theory-driven (e.g. CIC dimension) concepts [Figure 3]. Concepts not relating to the CIC definitions were coded based on the underlying theme in the interview passage and a new node (a.k.a. theme) was created (i.e. inductive coding) [see Appendix A for full list of coding nodes].
Interview data analysis

I compared the coded text of respondents within each landholder cohort (FTF, PTF, NF) to assess the extent a consistent pattern emerged within each CIC element. This was accomplished by running a ‘Code summary by node’ report in NVivo which collated each passage per node per interviewee into a concise, easy to review document placing all passages coded within the same node together; making for easy comparison. Each informant was ranked according to relevance for each CIC dimension. This allowed the 40 interviewees to be plotted on scales for each CIC dimension and element [see Figure 4 for an example; the first 20 entries are USA informants and the last 20 are AU informants.
Figure 4 Visual representation of relationship between respondents within and between cohorts based upon CIC relevance

Full time farmer interviews were summarized first as this group set the standard of comparison for the other two groups of landowners. This step of summarizing also allowed for the coding to be refined. Plotting the scores allowed for a visual representation of how each dimension might be assisting in segregating the landholders and indicated which dimensions were more or less applicable to certain landholder types. By plotting these numeric values I was able to assess, element by element, the extent that the CIC dimensions distinguished between the three cohorts of landholders [see Box 2 for qualitative data analysis overview] to answer part of research question one. The three dimensions of social embeddedness, behavioural involvement and self-categorization appear to be the most useful dimensions in segregating the farmers (both full and part-time) from the non-farmers.

Following is an overview of the qualitative data analyses implemented in this research.
Box 2 Qualitative data analysis steps

1. Transcribe audio recording of interviews into text using Dragon Naturally Speaking
2. Create nodes within NVivo based upon the CIC dimensions/elements
3. Import interview transcripts
4. Confirm interviewees were classified properly according to prescribed definitions
5. Code paragraph by paragraph highlighting portions of text and assigning it an existing node or creating a new node and assigning the passage to the new node
6. Create summary CIC profiles for each US interviewee (but not for AU as this was determined an unnecessary step)
7. Produce ‘code summary by node’ report to compare landholders within and between cohorts
8. Assign and graph numeric values of CIC relevance for each dimension for each respondent
9. Assessment of usefulness leading to creation of summary table of the usefulness of the CIC dimensions to distinguish between landholders in the US and AU

Based on the visual representation of the data points within the CIC dimension graphs, I rated the ability or usefulness (very useful, useful, little use, no use/unhelpful) of each CIC dimension to distinguish between individuals within each of the three landholder occupational identity types. A separate category of ‘potential use’ was also included to identify instances where there was a mix of assessments for a dimension across the three landholder types; the mixed responses generally included the full spectrum of uses (i.e. very useful to no use). This process was repeated to cover the observed relationships between FTF/PTF, FTF/NF and PTF/NF [Table 15]. Dimensions classified as ‘very useful’ provided a clear distinction between cohorts, while those classified as ‘no use/unhelpful’ provided limited distinction between the cohorts.
Table 15 Qualitative assessment of the ability (usefulness) of the CIC dimensions to distinguish full-time, part-time and non-farmer rural landholders in AU and USA

<table>
<thead>
<tr>
<th>CIC Dimensions</th>
<th>NF v FTF</th>
<th>NF v PTF</th>
<th>FTF v PTF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USA</td>
<td>AU</td>
<td>USA</td>
</tr>
<tr>
<td>Behavioural involvement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very</td>
<td>Very</td>
<td>Very</td>
</tr>
<tr>
<td>Self-categorization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very</td>
<td>Potential</td>
<td>Very</td>
</tr>
<tr>
<td>Importance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very</td>
<td>Little</td>
<td>Very</td>
</tr>
<tr>
<td>Social embeddedness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very</td>
<td>Little</td>
<td>Very</td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Very</td>
<td>Unhelpful</td>
<td>Potential</td>
</tr>
<tr>
<td>Content and meaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential</td>
<td>Little</td>
<td>Potential</td>
</tr>
<tr>
<td>Attachment and sense of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interdependence</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Scale: Very useful, useful, little use, no use/unhelpful, potential use (mixed responses generally including the full spectrum of usefulness)
Quantitative data

The quantitative portion of this research informed each of the three research questions:

RQ1 – Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?

RQ2 - Can an occupational identity scale based on CIC be used to provide a theory based typology of rural landholders?

RQ3 - What is the nature of the relationship between farmer identity and the land management of rural landholders?

The quantitative data allowed for the testing and creation of a farmer collective occupational identity construct (COIC) score which informed my response to the first research question. The answers to the first research question also contributed to my approach to subsequent research questions. Various behavioural and socio-demographic items within the survey assisted in respondent grouping based upon occupational identity using multivariate data analysis.

Study site: North Central Catchment Management Authority area

The study site in Australia was chosen based largely on the availability to partner with the North Central Catchment Management Authority (NC CMA) on a larger landholder assessment survey. The NC CMA is one of nine Catchment Management Authorities in Victoria. The research team negotiated space in the survey to include questions / statements pertaining to farmer occupational identity. The NC CMA encompasses a wide range of 16 local government areas (LGA) in north central Victoria. LGA in the south of the region are prone to more gradation in topography as rolling hills are present, contrasting with the largely flat landscape that is found in the northern LGAs [Map 5]. The NC CMA includes a mix of rural and urban areas with a mix of land uses and landholders. The large majority of landholders (72%) are principal residents of their rural property (mean absentee landholder for the region is 28%) and the extent
of absentee ownership varied across the region, with areas closer to Melbourne having higher levels of absentee ownership (Curtis and Mendham, 2015).

Map 5 North Central Catchment Management Area, Victoria, Australia

Surveys

Surveys are an economical tool to understand, describe, explain and explore variables in the larger population from which a sample was drawn (Babbie, 1990). Sample surveys have been used for more than 75 years to examine the opinions and behaviours of people on a variety of research topics (Dillman et al., 2009). Even so, surveys are not without their fair share of philosophical (e.g., inability to prove causal connections, loss of response context, reflect un-measurable facets), technique (e.g., too restrictive, reduction of responses into sterile numbers), and politically-based criticisms (e.g., surveys are intrinsically manipulative) (de Vaus, 1991). However surveys can provide information that is generally representative of a larger population (Dillman, et al., 2009). Survey analysis allows different conclusions to be drawn and has a different scope of inference than what is unveiled during qualitative interviews (Babbie, 1990). The information can be used in describing mass populations while
providing information that is key to informing a research question. Surveys are a low cost, convenient data gathering tool providing high representativeness of the population. Question development is key in ensuring items are ‘clean’ and that multiple aspects are not converged into a single question (i.e., double-barrelled) making it difficult for a respondent to answer (Babbie, 1990). When developing surveys, researchers consider a variety of items, including the mode of survey (e.g., mail, face-to-face, internet survey), word choice, question order, survey appearance, timing, bias and non-response rates among other factors that aid in ensuring a successful survey implementation and response rate.

**Surveying landholders**

Over the past 15 years, the research team including my supervisors at CSU (Professor Curtis) have pioneered the use of self-administered questionnaires to rural landholders to gather spatially-referenced social and farming data to inform regional natural resource management in Australia (Curtis et al., 2005; Mendham & Curtis, 2010). The social benchmarking surveys have been implemented in eleven catchments across south eastern Australia. In 2013, the CSU research team was contracted by the North Central Catchment Management Authority (NC CMA) to implement a survey in the corresponding Victorian region (about 2.5 hours drive from Albury). The team led by Prof Curtis and Dr Mendham coordinated survey development, the mail out process, data entry and analysis outside of the scope of my research. I was responsible for development of survey items and data analysis specific to my research questions.

For the regional surveys, 14 LGAs in the NC CMA provided access to their ratepayer list (similar to tax records in the USA) which was used to compile a list of all rural properties greater than 10 hectares (renters were not included). Eleven LGA supplied the CSU Spatial Data Analysis Network (SPAN) with their ratepayer lists, while three managed all mailings within their respective departments. The 10 ha threshold is accepted in Australia as an appropriate benchmark separating rural and urban land use, particularly on the periphery of cities. The Victorian Planning Scheme guidelines permit a minimum subdivision of eight hectares in the Rural Living Zone, a farming zone requires 40 ha, while a low density rural zone requires a minimum lot size of 0.4 ha (State Government of Victoria, 2013). For this research I was primarily interested in
rural areas and property owners as these individuals make the decisions about the large majority of rural land in the NC CMA region.

The potential for non-response bias is an issue with any survey instrument. Every effort was made to increase the response rate by implementing a modified Dillman (1978) Total Design Method process refined through the research team’s previous experience completing catchment surveys. Non-response bias can be addressed through different approaches including comparing respondents with the population their sample was drawn from or comparing respondents and non-respondents (Armstrong & Overton, 1977; Groves, 2006). The former is often reliant on a limited range of data and the latter can be achieved by contacting non-respondents, typically via a phone call, and gathering a limited range of data found in the survey. Limitations exist in both methods; population census data are based upon the entire population (urban and rural) – separating the census into a direct comparison of a sample is nearly impossible.

A total of 1,939 surveys were delivered with 794 returned surveys and 296 blanks, declines and/or return to senders leading to an overall response rate of 48.3%. To assess non-response bias, I used the estimates found in the 2011-12 Agricultural Resource Management Survey (ARM), which included all agricultural businesses recorded on the Australian Bureau of Statistics’ (ABS) Business Register in the NC CMA region with an estimated agricultural production above $5,000. This estimated value of agricultural operations is intended to exclude very small farming businesses (e.g. non-farmers) from the scope of the survey (Australian Bureau of Statistics, 2012a). Rural landholders in Australia are compelled by law to respond to the Agricultural Resource Management Survey and over 80% of landholders do complete and return surveys. Non-response bias was tested by comparing survey data for five items with data for the NC CMA region collected by the ABS through their farm surveys. The five topics of comparable data were the mean age of respondents, gender, property size, length of property management and participation in landcare employing a 95% confidence interval as the test. The results of those analyses suggest the survey respondents are representative of the wider cohort of rural landholders in the region.
The mean age of respondents in the ABS survey was 55.7 years, which was just outside of the sample parameters (mean=58.7 years, sample CI 57.9 - 59.6). The percentage of male respondents in the ABS survey was 86%, within the sample parameters, 83.4% males [80.4% - 86%] of this survey. The mean property size in the ABS survey was 537.3 ha (1,328 acres) - within the sample parameters, mean=584.1 ha [524.6 - 643.7]. The mean years of managing a property was 27.0 years in ABS survey, again just outside of the sample parameters, mean=28.8 [27.7, 29.9]. In the ABS survey, 31.7% of respondents were involved in landcare, just outside the sample parameters, 35.9% [32.4% - 39.4]. This suggests that the NC CMA survey respondents might be older and have managed their property longer and were slightly more involved in landcare than the ABS ARM respondents; however, given that two years had passed between the completion of the ABS survey and the implementation of my survey, these differences were potentially reduced (e.g., as the population aged an additional two years, gained additional management experience, and became more involved in landcare).

Moreover, even if differences in participant age and length of time managing properties did persist, they were small and we did not expect it would substantially influence responses. In addition, the ABS data specifically excludes non-farmers which are typically older (many move to the area upon retirement). The inclusion of non-farmers in the ABS calculations would likely adjust the parameters such that the population mean would likely fall within the sample mean parameters. Accordingly, I concluded this is likely an accurate and representative sample of the population and decided not to employ any weighting procedures to the data.

Absentee landholders can be farmers or non-farmers, including in the North Central region. In this study, a mean of 28% of landholders indicated that the rural property included in the survey was not their principal place of residence. Given that this research set out to determine if it was possible to develop a measure of farmer identity for all rural landholders, absentee landholders were deliberately not excluded from the study.

**Survey development**

The survey largely contained two portions: those included to address the dimensions of CIC and those that were of interest to the research team and the NC CMA. The CIC
survey items were informed by the literature review and interviews and developed to address my specific research questions. Survey items, outside of the CIC items, were based on literature, were piloted tested (see below), and have been successfully implemented in other research efforts throughout Australia by the research team (e.g. (Curtis & Mendham, 2012). These survey items provided information to answer each of my research questions. Values, beliefs, norms and attitudes are often used in literature to explain behaviour. It was also important to include such concepts in the survey for a comparison of utility of the CIC measures.

The individual survey items were first approved by the research team, followed by approval by the NC CMA steering committee, then followed by pilot testing workshops (n=3; 2 workshops with 10 landholders and 1 workshop with the steering committee) to ensure the clarity and answerability of the included items. Items previously untested – primarily variables expected to measure CIC – were the focus of the pre-testing workshops with the landholders while other survey items were also tested. A list of landholders in the Kyneton and Kerang, Victoria – both locations within the NC CMA - was provided by the NC CMA staff. This list included a mix of landholders who had varying levels of an agricultural focus and had different levels of urban influence. Initial contact was made starting the week of January 20, 2014 to gauge interest and availability for participation. Upon receiving confirmation that at least 5 individuals in each respective location were available, arrangements were made to secure a meeting facility.

A confirmation phone call (email in some cases) was provided to alert participants of the time and day of the workshop. A package was posted one week in advance to all participants, which included a sample survey, cover letter and envelope that all individuals would receive upon mass survey mail-out. A cover letter pertaining to the day’s agenda was also included along with payroll/reimbursement forms to ensure prompt payment of the $200 plus travel reimbursement. The participants were gathered to discuss the survey questions and unveil any potential issues that could occur with a larger dissemination of the survey. The research team compiled and discussed participant comments and some modifications in survey items were made to improve clarity. For example, the original term of ‘farmer’ in the occupational identity survey section was replaced with ‘agricultural producer’ upon the suggestion of many
workshop participants. This pretesting process was important as revising the items led to more respondents being able to relate to and answer the survey items regardless of how strongly they identified as a farmer. Without these revisions, items that might have been largely inapplicable to a wide range of respondents would likely have been removed from scale development. The pre-testing process pre-empted that need to disregard inadmissible items by generalizing the item content.

The final survey was comprised of the following eleven sections:

1. Long-term plans for your property (e.g. likelihood the property will be sold)
2. Your assessment of issues (e.g. importance of soil erosion affecting your property)
3. Why your property is important to you (e.g. property offers a place for recreation)
4. Your views (e.g. soil testing is an essential first step in understanding soil condition)
5. Preferred sources of information (e.g. field days, television, internet)
6. Occupational identity (e.g. I consider myself to be a typical agricultural producer in this area)
7. Your knowledge of different topics (e.g. knowledge of the role of understorey plants in maintaining native birds)
8. Risk and trust (e.g. I prefer to avoid risks)
9. Enterprise / Land use mix (e.g. is this property your principal place of residence)
10. Management practices on your property (e.g. used time controlled or rotational grazing over the last 12 months)
11. Your property (e.g. are you a member or involved with a local soil health group)

Measurement of survey items were reported on a closed (e.g. Likert scale, yes/no) and open-ended format. Likert responses included: (1) strongly agree; (2) disagree; (3) neutral; (4) agree; (5) strongly agree; (6) not applicable.
The following table [Table 16] presents questions included in the survey that are relevant to, and measure, the CIC dimensions. Survey items not used in the analysis of this research will not be discussed in detail [see Appendix B for full survey].
<table>
<thead>
<tr>
<th>Items</th>
<th>Survey statements measuring CIC</th>
<th>Dimension</th>
<th>Element</th>
<th>Question format</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>I very much identify with agricultural producers in my district</td>
<td>Self-categorization</td>
<td>Placing self in social category</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>B</td>
<td>My agricultural production activities distinguish me from those who are not agricultural producers</td>
<td>Self-categorization</td>
<td>Perceived certainty of self-identification</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>C</td>
<td>I consider myself to be a typical agricultural producer in this area</td>
<td>Self-categorization</td>
<td>Goodness of fit / Perceived similarity / prototypicality</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>D</td>
<td>Please circle the descriptor/term that best describes your occupational identity: (full-time farmer, part-time farmer, non-farmer)</td>
<td>Self-categorization</td>
<td>Placing self in social category</td>
<td>Categorical/Ordinal</td>
</tr>
<tr>
<td>E</td>
<td>What is your main occupation? (e.g. farmer, teacher, accountant, investor, retiree)</td>
<td>Self-categorization</td>
<td>Placing self in social category</td>
<td>Open-ended</td>
</tr>
<tr>
<td>F</td>
<td>What is the total area of rural land you own within the NC CMA? (excluding land you manage but do not own)**</td>
<td>Behavioural involvement</td>
<td>Behavioural involvement</td>
<td>Continuous/Scale</td>
</tr>
<tr>
<td>G</td>
<td>Estimate the average number of hours per week that you worked on farming/property related activities over the past 12 months**</td>
<td>Behavioural involvement</td>
<td>Behavioural involvement</td>
<td>Continuous/Scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>In general, I’m glad that I’m an agricultural producer</td>
<td>Evaluation</td>
<td>Private regard</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>I</td>
<td>In general, others respect agricultural producers</td>
<td>Evaluation</td>
<td>Public regard</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>J</td>
<td>Being a part of the larger group of agricultural producers is an important reflection of who I am</td>
<td>Importance</td>
<td>Explicit importance</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>K</td>
<td>In a typical day, I very seldom think about being a part of the larger group of agricultural producers*</td>
<td>Importance</td>
<td>Explicit importance</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>L</td>
<td>Imagine meeting someone informally for the first time. What two pieces of information would you share with them about yourself?**</td>
<td>Importance</td>
<td>Implicit importance</td>
<td>Open-ended</td>
</tr>
<tr>
<td>M</td>
<td>For the month of February 2014, estimate the proportion of people you met socially (for example, the people you went with or engaged with at an event, such as at a dinner, sporting event, family function, movies) who you consider are either full-time or part-time farmers**</td>
<td>Social embeddedness</td>
<td>Social embeddedness</td>
<td>Continuous/Scale</td>
</tr>
<tr>
<td>N</td>
<td>My regular social contacts and relationships are with other agricultural producers</td>
<td>Social embeddedness</td>
<td>Social embeddedness</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td>O</td>
<td>What happens to agricultural producers as a whole will have an effect on what happens in my life</td>
<td>Attachment &amp; sense of interdependence</td>
<td>Interdependence / Mutual fate</td>
<td>Likert/Ordinal</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Dimension</td>
<td>Scale</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>I have a strong sense of belonging or attachment to other agricultural</td>
<td>Attachment &amp; Sense of Interdependence</td>
<td>Likert/Ordinal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>producers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>When someone criticises agricultural producers, it feels like a personal</td>
<td>Attachment &amp; Sense of Interdependence</td>
<td>Likert/Ordinal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>insult</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>The economic position of agricultural producers has worsened a lot over</td>
<td>Content and Meaning</td>
<td>Likert/Ordinal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>The social position of agricultural producers has improved a lot over time*</td>
<td>Content and Meaning</td>
<td>Likert/Ordinal</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *Indicates items that were reverse coded prior to analysis
** Indicates items that were transformed from continuous variables into Likert categories
Analysis of regional mail surveys

Survey data was analysed using IBM SPSS 20 statistical analysis software. Parametric and non-parametric tests including Spearman’s Rho correlations, Kruskal-Wallis tests, regression, cluster and factor analysis are utilized to explore relationships between independent and dependent variables (Field, 2005; Hair et al., 2010; Pallant, 2005; Vaske, 2008).

The following box outlines both the data preparation and analyses steps of my quantitative analyses; each research question builds on one another. Additional detail is provided in subsequent sections.

Box 3 SPSS Data preparation/analysis steps

Research question one:

1. Reverse code two negatively worded statements (items K & S)
2. Recode 3 OI continuous items (F, G, M) into a 5 categorical response variable (further described in subsequent ‘data transformation’ section).
3. Recode one open-ended string item (L) into a 5 categorical response variable (further described in subsequent ‘data transformation’ section).
4. Recode all CIC ‘not applicable’ item responses from a ‘6’ to a ‘0’ for inclusion in the scale development.
5. Remove one CIC item (L) with unacceptable missing value rate and replace missing values for 3 separate items (F, G, M) with missing values greater than 5% with the random assignment within group solution.
6. Run the reliability statistics to determine Cronbach’s alpha. Based on results, removed 3 items (I, R, S).
7. Run factor analysis to confirm scale cohesion. One additional survey item (K) was identified as problematic and removed.
8. Rerun reliability statistic to determine Cronbach’s alpha of the revised scale.

Research question two:

9. Run principal component analysis to form landholder clusters.

Research question three:

10. Run general linear models (e.g. logistic regression and multiple regression) to examine the relationship between behaviour and farmer identity.
Scale development

The scale was developed to answer each of the research questions: Is it possible to classify rural landholders based on occupational identity using the CIC?; Can an OI scale based on CIC be used to provide a theory based typology of rural landholders?; What is the nature of the relationship of the farmer component of personal identity and behaviour? The scale scores assigned to the survey respondents were used in the statistical analysis as explained below.

Data transformation

Three statements relating to CIC dimensions in the survey were based on a continuous scale. These items were re-coded into five categorical response options in order to be directly comparable to the remaining OI questions, allowing for the inclusion of reliability testing on all items at once. One open-ended question was also recoded to reflect the degree of association with a farmer identity. The process used in each case is described below.

1. Item M - For the month of February 2014, estimate the proportion of people you met socially (for example, the people you went with or engaged with at an event, such as at a dinner, sporting event, family function, movies) who you consider are either full-time or part-time farmers

Respondents were asked to estimate the proportion of people they met socially who they considered to be either full-time or part-time farmers between 0 and 100%. Respondents answers spanned across the full scale. Neither Ashmore, et al. (2004) nor Stryker and Serpe (1994) provide any insight on how to break up the data into a scale.

Several different methods were trialled to divide the data in groups, before I selected the natural jenks method. First, I divided the overall scale into five groups of 20% each of the total possible percentage (i.e. 0-20%; 21-40%; 41-60%; 61-80%; 81-100% of people they meet socially who are farmers or part time farmers). Next, I separated the respondents based upon five equal groups of respondents of about 20% each (i.e. 0-4%; 5-19%; 20-49%; 50-69%; 70-100% of people they meet socially who are farmers or part time farmers). I then used the ‘natural jenks’ method to group the data by maximising between-class differences and minimizing within-class differences using
ArcGIS. While the previous two attempts to divide the data into five groups were similar in some respect to the natural jenks outcome, discussion with the research team led to the natural jenks option being used to create the new categorical variable that was used in further analysis. The natural jenks method was preferred as it is a more accurate reflection of the other Likert statements in that separating the data into five segments based upon the respondents (and not the scale) would have resulted in a uniform distribution. This new variable included a Likert scale (1 to 5) based upon interaction with either part-time or full-time farmers [Table 17].

Table 17 Natural jenks produced categories in social interactions with full or part-time farmers

<table>
<thead>
<tr>
<th>Proportion of full/part-time farmer social contacts</th>
<th>Respondents (n=736)</th>
<th>% of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10%</td>
<td>249</td>
<td>34%</td>
</tr>
<tr>
<td>11-35%</td>
<td>141</td>
<td>19%</td>
</tr>
<tr>
<td>36-55%</td>
<td>151</td>
<td>21%</td>
</tr>
<tr>
<td>56-75%</td>
<td>91</td>
<td>12%</td>
</tr>
<tr>
<td>76-100%</td>
<td>104</td>
<td>14%</td>
</tr>
</tbody>
</table>

2. Item F - What is the total area of rural land you own within the NC CMA (excluding land you manage but do not own)?

This continuous (open-ended) statement asked respondents to report the amount of hectares owned. In an attempt to ultimately create a scale that can be universally used, considerations were made on how to best separate the land owned into discrete categories. Based upon the histogram, the responses are highly skewed. Literature was reviewed on past attempts to classify or separate landholders based upon property size. Some consistency and overlap exists in these previous approaches [Box 4], however no evidence of a consistently used scale was found. Relying on past classifications would likely prove unsuccessful as property size differs widely (e.g. based upon topography, enterprise, proximity to urban areas). Accordingly, I chose to consult with a local expert, in this case a catchment management official, regarding the types of landholders and their property sizes in their area. Based on these discussions, I developed a new categorical item that classified property ownership into
five categories relevant to the local context [Table 18]. This classification system was used to recode the data from a continuous variable into a categorical response. This method (e.g., discussing with a local expert to identify appropriate categories of land ownership) would prove reliable and useful regardless of the context as local knowledge would form the basis of classification division.

**Box 4 Property size categories as found in the literature**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Southwestern Victoria, Australia, landholder decision making in ha: 10-50; 51-100; 101-200; 201-400; 401-600; 601-800; 801-1000; &gt;1000 (Byron et al., 2004)</td>
</tr>
<tr>
<td>B</td>
<td>Northwest Victoria, Australia, farm business structure in ha: 0-49; 50-99; 100-249; 250-499; &gt;500 (Weller et al., 2013)</td>
</tr>
<tr>
<td>C</td>
<td>Southeast New South Wales, Australia, amenity landscape implications in ha: &gt;120 ha (full-time residents, off-farm income important, but objective is to earn a living off the land-full time graziers); 20-120 (full-time residents, majority of income from off-farm work, amenity use – full-time lifestylers (amenity buyers), commuters, hobby farmers, retirees, seekers of a rural retreat); 20-120 (‘weekenders’ or occasional visitors, primary residence is elsewhere, off-farm employment, amenity use – part-time lifestylers (amenity buyers), hobby farmers, land investors, recreationalists, rural retreat seekers (Klepeis et al., 2009)</td>
</tr>
<tr>
<td>D</td>
<td>Northern Queensland, Australia, change in social and physical landscape based on average farm size in ha: 20 (lifestyle farmers); 30 (hobby farmers); 80 (early diversifiers); 250 (traditional specialized sugarcane farmers); 300 (traditional mixed farmers) (Bohnet, 2008)</td>
</tr>
<tr>
<td>E</td>
<td>Northeastern United States, women in farming (in acres): 1-9; 10-49; 50-179; 180-499; &gt;500 (Brasier et al., 2014)</td>
</tr>
<tr>
<td>F</td>
<td>North America, farm diversification (in acres): 10-49; 50-99; 100-249; 250-499; &gt;500 (Barbieri et al., 2008)</td>
</tr>
</tbody>
</table>
Table 18 Property size categories based upon CMA judgment

<table>
<thead>
<tr>
<th>Description of land use</th>
<th>Hectares owned</th>
<th>n</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive (pigs, chooks), vineyards, hobby farms</td>
<td>&lt;40</td>
<td>165</td>
<td>23%</td>
</tr>
<tr>
<td>Small mixed enterprises, dairy or grazing</td>
<td>40-120</td>
<td>120</td>
<td>16%</td>
</tr>
<tr>
<td>Dairy, mixed, small cropping</td>
<td>121-240</td>
<td>67</td>
<td>9%</td>
</tr>
<tr>
<td>Big dairy, grazing or mixed, cropping</td>
<td>241-480</td>
<td>107</td>
<td>15%</td>
</tr>
<tr>
<td>Big extensive grazing, cropping or mixed; or land moguls</td>
<td>&gt;480</td>
<td>270</td>
<td>37%</td>
</tr>
</tbody>
</table>

3. Item G - *Estimate the average number of hours per week that you worked on farming/property related activities over the past 12 months*

Respondents were asked to report the average number of hours per week that they spent working on their property within the last 12 months (open-ended question). Based on the distribution of data, five categories were developed [Table 19] based largely upon the state/national imposed standard that 35 hours per week is considered full time employment. A classification system presented by the ABS of weekly hours worked by occupation revealed the following categories (in hours): 0-15; 16-34; 35-40; 41-48; >49. The categories developed here follow this breakdown very closely. The dataset was transformed into the categories observed in the table below [Table 19].

Table 19 Categorical classification of hours worked per week on property

<table>
<thead>
<tr>
<th>Hours worked on property</th>
<th>n</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Total n = 707)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-16 hrs</td>
<td>223</td>
<td>32%</td>
</tr>
<tr>
<td>17-34 hrs</td>
<td>111</td>
<td>16%</td>
</tr>
<tr>
<td>35-50 hrs</td>
<td>147</td>
<td>21%</td>
</tr>
<tr>
<td>51-69 hrs</td>
<td>179</td>
<td>25%</td>
</tr>
<tr>
<td>&gt;70</td>
<td>47</td>
<td>7%</td>
</tr>
</tbody>
</table>
4. Item L - Imagine meeting someone informally for the first time. What two pieces of information would you share with them about yourself?

This item was an open-ended question asking respondents to report what two pieces of information they would share about themselves with someone they informally just met. This question addresses the element of implicit importance. Those who have a higher/stronger connection to a farming identity would likely list information related to farming, and those without a farmer identity would likely list non-agricultural related pieces of information. Ashmore, et al. (2004) and Stryker and Serpe (1994) provided no insight into how to develop a scale from the provided responses.

The data were re-coded into five categories based upon the amount of association to a farmer identity. Rules for each category were developed and the data were re-coded [Table 20]. For instance, a respondent listing “custodian of rural land and passionately hate swearing people” would be re-coded as having a ‘minimal association’ (i.e. 2) as the information contains one piece of information indirectly related to a farmer identity while the other piece is unrelated to a farmer identity. In instances where more than two pieces of information were listed only the first two pieces of information provided by the respondent were considered. The recoding of this open-ended question resulted in the following data distribution [Table 21].

**Missing values**

I established a threshold of 5% missing values to consider data manipulation, but was reluctant to exclude variables from analysis and evaluated a number of possible ways to address the issue of missing data. As Vaske (2008) explains, when data are missing at random, this problem is ‘typically not serious’. A detailed account of how missing values were handled is found in Chapter 4 [Research question 1C].
<table>
<thead>
<tr>
<th>Likert Scale</th>
<th>Category Name</th>
<th>Rules</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No association</td>
<td>Neither piece of information is related to a farmer identity</td>
<td>‘Name &amp; district’; ‘lawyer &amp; independent director’</td>
</tr>
<tr>
<td>2</td>
<td>Minimal association</td>
<td>One piece of information is indirectly related to a farmer identity; one piece is unrelated to farmer identity</td>
<td>‘Family &amp; passion for native plants and animals’; ‘custodian of rural land &amp; passionately hate swearing people’</td>
</tr>
<tr>
<td>3</td>
<td>Some association</td>
<td>One piece of information is directly related to a farmer identity; one piece is unrelated</td>
<td>‘Interest in farm forestry &amp; family’; ‘love of farm &amp; family’</td>
</tr>
<tr>
<td>4</td>
<td>Closely associated</td>
<td>Two pieces of information are related to a farmer identity: one directly related and one indirectly related</td>
<td>‘Occupation (farming) &amp; preserving nature’; ‘farmer &amp; plant trees’</td>
</tr>
<tr>
<td>5</td>
<td>Intimately associated</td>
<td>Two pieces of information are directly related to a farming identity</td>
<td>‘Part-time farmer &amp; love farms’; ‘prime lamb farmers &amp; hate weeds on farm’</td>
</tr>
<tr>
<td>Likert category</td>
<td>Frequency</td>
<td>Percent of respondents</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>(1) No association with a farmer identity</td>
<td>183</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>(2) Minimal association with a farmer identity</td>
<td>56</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>(3) Some association with a farmer identity</td>
<td>204</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>(4) Closely associated with a farmer identity</td>
<td>35</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>(5) Intimately associated with a farmer identity</td>
<td>32</td>
<td>6%</td>
<td></td>
</tr>
</tbody>
</table>

**Development of the scale**

Questionnaires contain many pieces of intertwined information. A scale is a “composite measure of a concept, a measure composed of information derived from several questions or indicators” (de Vaus, 1991, p. 249). Scale creation entails converting information from several specific variables to one that is more abstract. Multiple questions regarding the same topic are generally used to understand a complex concept.

Scales containing multiple items are preferred over single-item measures as it helps increase reliability and avoid misclassification (de Vaus, 1991). The wording of a question can substantially affect the way people answer it. The answers to only one question measuring a concept could largely be a function of the wording of the question and not necessarily accurately represent the concept itself. Multi-item scales allow for more precision in differentiating individuals – a single item only allows for separation in a limited number of ways (e.g. yes/no or categorical). Scale development also considerably simplifies analysis as each question included does not have to be analysed separately (de Vaus, 1991). Multi-item scales contain multiple variables that, when added together, form an overall score or a scale score. This score then measures
the respondents’ position on an abstract dimension by measuring the position on a number of items.

de Vaus (2002) has provided six steps to construct a scale.

1. Identify the topic of interest

2. Develop a set of questions that appear to be relevant measures of a concept

3. Pretest the draft questions with a similar sample of individuals who will ultimately be targeted

4. Score the response to each question

5. Reverse code any items that are worded differently (e.g. negatively) from the rest

6. Total each individual’s score on the included scale items to obtain their scale score

However, one must be careful not to include items that do not really belong. While on face value these items may appear to measure the same or a similar concept, it is not guaranteed that this is the case. Unidimensionality and reliability must be considered when selecting the best items to include in the scale (de Vaus, 1991). The items must belong together conceptually – a unidimensional scale is just that. The correlation coefficients test for the difference between individual item scores versus scores on the rest of the items in the scale. The item-to-scale co-efficient lies between 0 and 1, and as de Vaus (2002) claim the rule of thumb is that items with scores of less than 0.3 should be dropped from the scale.

Inter-item correlations measure the consistency of an individuals’ response across all scale items provided by an alpha number ranging from 0 – 1. de Vaus (2002) also provides a rule of thumb relating to reliability – the value of alpha should be at a minimum 0.7 before claims can be made of the scales reliability. The reliability of the items included in the scale is determined by the number of items in the scale; dropping all unreliable items will increase the alpha value and the scales’ reliability. Scale development is included in depth in Chapter 4.
**Cluster Analysis**

Cluster analysis was used to answer research question two (Can an OI scale based on CIC be used to provide a theory based typology of rural landholders?). Cluster analysis is a multivariate technique aimed at forming homogenous subgroups within a larger population (Garson, 2014; Hair, et al., 2010). The aim of cluster analysis is to minimize in-group variation while maximizing between group variation. This technique is often used by researchers to cluster observations when the number of groups is not known in advance (Garson, 2014). In the development of the typology of landholders to address research question two, cluster analysis was employed.

Examples of cluster analysis which informed this research were found in Barnes et al. (2011), Jansujwicz, et al. (2013), Kuehne, et al. (2008); Morrison, et al. (2012), and Emtage and Herbohn (2012). The description of the process undertaken for cluster analysis found in Barnes, et al. (2011), in combination with the six stage process of cluster analysis found in Hair, et al. (2010), led to the decision to use both a hierarchical and nonhierarchical procedure in this research. An outline of the steps employed is below with a detailed explanation in Chapter 5.

1. **Identification of objectives.** The objectives of cluster analysis in this research are two-fold: the development of a typology and the identification of relationships among observations. The typology was dependent upon the twelve valid and reliable CIC items which were used in the clustering of the respondents.

2. **Research design.** A number of measures were utilized to ascertain the inter-object similarity including Euclidean distance and squared Euclidean distance. Various measures of standardizing the data were employed and compared including conversion of each item to a Z score and the transformation from a 5-point to a 6-point response for three items to correspond to the response scale of the other nine items.

3. **Assumptions in the cluster analysis.** The dataset is representative of the population and multicollinearity was assessed between the items – no two items were correlated above $r = 0.8$. 

124
4. Deriving clusters and assessing overall fit. Both hierarchical and nonhierarchical procedures were employed to overcome the weaknesses of each procedure. The agglomerative method employing multiple clustering algorithms was first used to indicate the appropriate number of clusters. This process was followed-up by the nonhierarchical procedure (e.g. k-means) in which I specified that four clusters were to be formed based on the hierarchical results in which the biggest jump in heterogeneity was observed between the number of clusters formed.

5. Interpretation of clusters. The clusters were examined and labels were given to identify the different clusters.

6. Validation and profiling of the clusters. In establishing criterion validity a number of items not included in the clustering procedure were used to test for statistical differences between clusters. To profile the clusters, I employed ANOVA and discriminate analysis to further describe the respondents within each cluster.

**General linear models**

General linear models (GLM) were used to answer research question three (What is the nature of the relationship of the farmer component of personal identity and behaviour?). GLM are a family of models which provide a single estimation model (Hair, et al., 2010) based on prediction (Tabachnick & Fidell, 2007). GLM are flexible and simplistic in model design and based upon the value of a dependent variable as a result of a combination of independent variables and some error (Hair, et al., 2010; Tabachnick & Fidell, 2007). Pairs of variables are assumed to have a linear relationship with each other (Tabachnick & Fidell, 2007). A plethora of GLM exists (Field, 2013).

Logistic regression (LR) is one such method used to estimate the probability of an event occurring. LR models require a dichotomous dependent variable and one or more dichotomous or continuous independent variables, whereas multiple regression, another GLM, requires a continuous dependent variable (Vaske, 2008). Multiple entry methods were trialled in the model formation. Forward stepwise likelihood ratio was ultimately selected as the likelihood ratio statistic is the “best criterion for deciding
which variables are to be removed if a stepwise procedure is used” (Vaske, 2008, p. 463).

As the GLM is based upon the assumption of a linear relationship it was important to determine if collinearity was a factor. The following outline illustrates the general steps taken in the logistic and multiple regression model building.

1. Check for high correlations ($r>.8$) among items. Two items exhibiting high correlations were noted and only one of the pair of items was included in the model.

2. A Kruskal-Wallis H test and Pearson chi-square tests were utilized to indicate which items were significantly related to the ‘behaviour’ items of interest. Due to the number of possible items to input only those items with significant relationships ($p<.05$) were considered for entry into the model and those items that were related to the dependent variable. The rule of a minimum of ten observations per parameter within the dependent variable groups was adhered to (Hair, et al., 2010); in cases where a large number ($n>20$) of items held significant relationships with a behaviour item, those items with the smallest $p$ value were entered into SPSS in addition to those items that most closely aligned in topic. Five behaviour items were selected from the survey, including one practice related to biodiversity conservation, two practices related to sustainable agriculture, and two generic practices relevant to most all landholders. Only behaviour items in which greater than 50% of respondents participated in the activity were considered for analysis.

3. Two types of models were generated for each behaviour item. One ‘inclusive’, open to all survey items, and one ‘restricted’, open to items related to values, beliefs, norms, attitudes, risk and trust. As there were three items measuring occupational identity (e.g. selection of a farmer type label, COIC score, and self-declaration of occupation), COIC was used in every instance the $p$ value was significant. Removal of COIC and entry of the other two items, one at a time, was also tested to identify the influence of each on the model.

Further detail can be found in Chapter 6.
Validity & reliability

Social researchers must address the issues of validity and reliability to establish the credibility and legitimacy of their research. All measures are ‘imperfect’ and are susceptible to error and fluctuation (Crano & Brewer, 2002). Validity and reliability are really tests of research quality, but have different methods for qualitative and quantitative research in the social sciences. Yin (2014) states that there are four tests, common to all social science methods that are used to assess research quality: construct validity, internal validity, external validity and reliability. Broadly, validity focuses on the extent a construct measures what it is intended to measure while reliability refers to the likelihood of achieving consistent results when applying the same research instrument a number of times in a research setting (Babbie, 2011). An overview of the topics will be discussed in this section, while a thorough explanation of how the measures were employed in analysis is covered in a subsequent chapter.

Validity

Validity is the process of assessing whether “researchers see what they think they see” (Flick, 2009, p. 387) and is “crucial from the standpoint of theory development” (Crano & Brewer, 2002, p. 45). Validity is open to interpretation and criticism, and may change over time. Similarly, term names also change as preferences change or the field of testing advances; some qualitative researchers prefer to use the terms ‘credibility’ or ‘dependability’ in place of validity (Babbie, 2011).

Qualitative validity

Some methods for achieving validity include checking for accuracy in the research findings by employing such measures as rechecking transcripts for mistakes and crosschecking codes; triangulation (which uses different data sources to build a coherent pattern or theme of overall data); use of member checking (which entails asking research participants to verify findings or perceptions); and/or the use of rich, thick descriptions (which sheds light on shared experiences and a full description of the context/perception); and/or presenting negative or discrepant information (which adds to the realism and validity of the text) (Creswell, 2009). An alternative term for ‘member checking’ is Flick’s (2009) use of ‘communicative validation’, and perhaps one additional benefit that Creswell (2009) does not directly make obvious is the added
benefit for the interviewee to understand the structure of the relationship between their opinions/views and the larger structure that is being studied by the researcher.

**Quantitative validity**

There are also a number of ways to check validity in quantitative data. One such way is the use of content validity in which different aspects of a concept are measured (Babbie, 2011). For instance a test of history that only addresses Australia, but lacks measurement of world wars, genocide, invasions, famines or colonization would lack content validity. Content validity must measure what is normally included in a definition of the concept (de Vaus, 1991). Frey et al. (2000) assert that one form of content validity is face validity which is based on being able to reflect a concept being studied, yet is the weakest form of validity. In fact, Crano and Brewer (2002) harshly criticize the use of face validity as it is not sufficient and is a “well-worn but practically meaningless term” (p. 45).

Construct validity is another attempt to determine how well a measure meets theoretical expectations (de Vaus, 1991; Pallant, 2011). Construct validity tests whether hypothesized relationships between groups exist. Crano and Brewer (2002) propose that the ‘known groups’ method is the most common way to achieve this validation. Here, a measure of the proposed construct is given to different groups of people who are known to differ on an attribute that is the focus of the instrument. If the scale works, then these groups will have different scores, however the lack of difference in expected scores, or a reversal in expected levels of scores is a clear indication that the validation has failed (Crano & Brewer, 2002).

**Triangulation**

Triangulation can promote the quality of both qualitative and quantitative research. Triangulation is the process of examining evidence from different sources to build a coherent justification (Creswell, 2003, 2009). Findings from one source can be assessed and supported (or refuted) by other sources (Babbie, 2013; Yin, 2014) and is largely associated with studies employing mixed methods (Teddle & Tashakkori, 2009). Creswell (2013b) called for the use of one form of qualitative and one form of quantitative data collection in employing triangulation. For many researchers, triangulation lies simply in data triangulation (the comparison of data from multiple
data collection methods); as opposed to the wider breadth of triangulation including the use of multiple researchers, multiple theories and multiple data technologies (Berg & Lune, 2012; Flick, 2009). Employing multiple forms of data collection (a.k.a. data triangulation) reduces the instances that errors will be made within each method; the methods “will each miss the mark to some extent, that is, but they will miss it in different ways” thus reducing the instances of error overall and increasing confidence in the data findings (Crano & Brewer, 2002, p. 10). Denzin and Lincoln (2008) refute other researchers who include triangulation as a form of validation. Instead the authors offer triangulation as an alternative to validation which adds richness, breadth, depth, complexity and rigor to an inquiry.

**Validity checks in this research**

Throughout this research I employed qualitative validity checks in the form of checking transcripts for mistakes and crosschecking codes in addition to triangulation, the use of rich, thick descriptions, and presenting negative or discrepant information.

In quantitative research, internal validity refers to the confidence that a research design is soundly based, while external validity is the extent to which the findings are generalisable (Babbie, 2011; Creswell, 2009). Measurement validity (including face validity; criterion – related validity, construct validity; and content validity) are also important issues along with research reliability. Criterion validity, for instance, addresses the “relationship between scale scores and some specified, measurable criterion” (Pallant, 2011, p. 7).

Quantitative validity was achieved through content validity which is addressed through the use of a wide range of items that addressed a range of issues related to a farmer collective identity based on the research teams’ expertise and reliance on published literature. Including the selected questions also meets face validity criteria as they logically cover the aspects of a farmer identity. Pilot testing the survey established content validity of the questionnaire by trialling items to measure different concepts of a farmer identity (Creswell, 2009).

Construct validity was tested to examine the existence of hypothesized relationships between the devised OI scale scores and OI based on other items (e.g. time spent working on property) through statistical analysis based on the quantitative survey
data. These differences in scores for each landholder cohort add to the validity of the devised scale. A full explanation can be found in Chapter 4.

**Reliability**

Reliability is a measure of achieving the same result on repeated uses of the same instrument (de Vaus, 1991; Field, 2005; Pallant, 2011). Depending on the type of data of interest, there are many methods or techniques to assess the reliability of data. As in the realm of validity, multiple terms are used interchangeably to describe similar methods of reliability.

**Qualitative reliability**

One such term for reliability is rigour which indicates the consistency of applying a research method, sampling scheme or data analysis (Flick, 2007). Consistency is very important in assessing reliability. Maintaining a minimum level of consistency (e.g. asking the same questions to all participants, asking the questions in similar ways, covering all topics) is important. At the same time, Flick (2007) states that the importance of flexibility cannot be understated, “very good interviews always profit from the flexibility of the researchers to adapt their questions to the individual participant and the course of the concrete interview” (p. 64). So while a researcher must be consistent, they must also be flexible which seems to counteract the meaning of consistency. The problem with these criteria lie in the inherent lack of benchmarks for judgment; there is a lack of consensus about which criteria and what standards are acceptable in determining ‘good qualitative research’ (Flick, 2007). The underlying concept of clarity is emphasized in Flick (2009) who states that clarity in the division between the data itself and the researchers’ interpretation; interview training and the rechecking of data and procedures; and the clarity and transparency in the research process. The reliability of interview data for example, can increase through interview training and reflecting on interview guides (Flick, 2009).

**Quantitative reliability**

In quantitative terms, reliability assumes that a score obtained from any measure accounts for both the true score and random errors leading to fluctuation in the concept being measured (Crano & Brewer, 2002). Errors in reliability may result in
poor question wording or different interpretations of questions (de Vaus, 1991). Testing the reliability of a single item to test a concept can best be achieved by test-retest. However this method is largely impractical as it requires retesting the same participants weeks later. In doing so however, they may have remembered their answer and give the same response – while this correlation co-efficient between both (time 1 and time 2) would be high (0.8 or above) one can’t assume that the question is reliable (de Vaus, 1991). An alternative to this is to test a similar but smaller sample. As de Vaus (1991) states the “best way to create reliable indicators is to use multi-item indicators … [however] the best [overall] course is to use well-tested questions from reputable questionnaires” (p. 55). Careful question wording is one method to increase the reliability of a survey questionnaire.

**Internal consistency**

Internal consistency tests to see if all variables measure the same underlying construct. The most common way to test a scale’s internal consistency is the use of Cronbach’s alpha coefficient (Crano & Brewer, 2002; Field, 2013). The coefficient alpha “represents an indispensable aspect of the scale construction process” (Crano & Brewer, 2002, p. 41). Nunnally (1978 as found in Pallant, 2011) recommends a minimum alpha level of 0.7; Crano and Brewer (2002) suggests that a alpha coefficient value of 0.75 is considered acceptable. Scales with less than 10 items may have Cronbach alpha values quite small, and it may benefit the researcher to rely on the mean inter-item correlation for the items; “optimal mean inter-item correlation values range from .2 to .4 (as recommended by Briggs & Cheek)” (Pallant, 2011, p. 6).

However, it must be noted that the more items included in a scale generally result in a higher alpha level but adding additional items (when there is already a multitude of items, for example 15) will result in a minimal increase in the alpha level (Crano & Brewer, 2002; de Vaus, 1991). The reliance on Cronbach’s alpha and the inter-item correlation coefficient aid in the confidence that the items selected for a scale are reliable.

**Reliability checks in this research**

Qualitative reliability was achieved in this research as I have been trained and have previous experience conducting interviews. Throughout the interviews, I consistently
asked the same questions in a similar order, yet was flexible enough to modify the questions or the order to fit the direction of the interviewees’ discussion and repeatedly reflected on the interview guide to assess the wording of the questions and the ability to elicit an ‘appropriate’ response.

In addition, reliability was affirmed when in March 2014, three months after the initial coding, I reread and recoded two transcripts to ensure that I would code the same interview passages the same way at a different point in time. I also rescored the individual USA interviews to assess the applicability of the CIC dimensions. The values assigned in this iteration of coding matched either exactly (in the majority of cases) or was one number (score) different; this tests that my subjective assessment of the strength/relevance of the individual dimensions had not changed over time and lends support to the reliability of this research.

Quantitative reliability was achieved through the use of statistical testing. A Cronbach’s alpha level of 0.7 was used as the rule of thumb in deciding which items to include in the scale. The inter-item correlation coefficient value of 0.3 was used to determine items that were assessing different concepts (see previous discussion in the ‘scale development’ section).

The use of triangulation in the form of multiple sources of information (e.g. literature and respondents) as well as various forms of data collection (interviews, pilot testing survey instrument, and surveys) maximizes the information obtained yet minimizes the error of each individual technique as the error in one technique is overlapped by a strength in another.

**Challenges**

Every research endeavour is prone to challenges and is constrained by some factors. Recognition and careful consideration of these factors were accounted for and mitigated to ensure a high quality of research. A number of challenges were experienced in this research project. The time period of interviewing largely coincided with harvest/planting season which made contact with those tied to agriculture more difficult. Some additional challenges included identifying non-farmers in Wayne County and obtaining names of informants within the Shire of Campaspe; this proved more difficult than initially expected. Privacy restrictions prohibited the NC CMA from
providing landholder names and contact details; other accommodations were made to make initial contact with landholders, but this provided a setback in data collection. Obtaining all mailing lists from the LGAs proved more difficult than first conceived which also delayed data collection. Adjustments were made throughout the completion of the research project to overcome these obstacles.

**Ethical considerations**

Each research decision relies upon ontological, epistemological, methodological and ethical principles. Ethics, typically associated with morality, is the judgment of ‘right from wrong’ (Babbie, 2013). The Charles Sturt University (CSU) Ethics in Human Research Committee’s code of ethical conduct guided this research. CSU Ethics in Human Research Committee approved my proposal “Nature and outcomes of farming as a collective identity”, Ethics approval number - 410/2013/05.

Some of the ethical issues to be considered are listed below.

- **Ensuring participation is voluntary** (Babbie, 2013). Participants must not be forced to comply against their free will.

- **Protecting participants from foreseen or unseen harm** (Babbie, 2013; Flick, 2009). Any stress or foreseen harm must be minimized and disclosed to the participant before participation.

- **Anonymity** (Babbie, 2013). Participants must not be promised anonymity if the researcher or reader can identify a response with a respondent.

- **Confidentiality** (Babbie, 2013). Promises of confidentiality ensure that while the researcher can identify a person’s response, he/she will not do so publicly.

- **Deception within research of your own identity or the rationale behind a study is unethical** (Babbie, 2013). Any deception “needs to be justified by compelling scientific or administrative concerns…” even so “the justification will be arguable” (Babbie, 2013, p. 68). Debriefing subjects afterward may combat initial deceit.
• Truthful analysis and reporting of all facets of the research related to the project, including, but not limited to, negative discoveries, pitfalls and problems, and carelessness (Babbie, 2013).

• All people should be treated equally and with respect (Flick, 2009).

Before the interview commenced, the information sheet was provided to participants and informed consent was obtained via a consent form. After disclosing the purpose of the project, the process, sponsorship, and outputs (e.g. thesis, report, conference presentations and journal articles) were discussed. Direct quotes and other material presented are not accompanied by any identifying information. Direct quotes are only identified by farmer cohort and interview number. Each participant was informed of their ability to withdraw from the project at any time, and ability to stop the audio recording of the interview if they wished without repercussion to them. The regional survey was accompanied by a letter introducing the project, explaining the research purpose, and how the information would be used. Return of the survey was to be consent to participate in the research. Respondents were provided a 1800 hotline number and email contact to clarify any questions of confusion regarding the survey.
CHAPTER 4 RESULTS – RESEARCH QUESTION ONE A & B

The utility of a collective identity construct to explore the influence of farming identity on natural resource management\(^6\)

Abstract:

Change in the occupational identity of rural residents is expected to influence natural resource management (NRM). Self-declaration is the most common way of assessing occupational identity (OI) but is largely atheoretical. Researchers have suggested that the collective identity construct (CIC) might provide a theoretically derived and reliable measure of OI. In this paper we reflect on the first attempt to evaluate the application of the CIC in the NRM context. Rural landholders in Australia and the USA were interviewed to assess whether the CIC would distinguish between full-time, part-time and non-farmers; and determine whether there were opportunities to refine the lengthy list of CIC dimensions and elements for future studies. This research suggests the CIC will be an effective measure of OI in that differences between the landholder cohorts emerged for five of seven CIC dimensions. We conclude by suggesting how these dimensions might be operationalised in a survey.

Research approach

Introduction

In this paper, we discuss the insights gained about the potential application of the CIC. Results will inform development of survey items that can be used to explore the nature and role of OI in NRM by rural landholders. Using a case study design, we completed interviews with 40 informants (20 in Australia and 20 in the USA). We set out to assess the extent the CIC was able to distinguish between full-time farmers (FTF), part-time farmers (PTF) and non-farmers (NF) in different developed economy contexts; and whether each of the seven CIC dimensions (and 14 elements within those dimensions) were needed to assess OI amongst rural landholders.

\(^6\) *This chapter has been accepted as Groth, T., Curtis, A., Toman, E., & Mendham, E. (In press). Society and Natural Resources.*
We distinguished the three categories of rural landholders (FTF, PTF, NF) based on previous research suggesting there are differences among these categories regarding the purpose of owning rural property and the level of commitment to farming as a livelihood (Curtis et al. 2008; Mendham et al. 2012; Race et al. 2012). Race et al. (2012), for example, found that classifying landholders into three types (full-time farmers, part-time farming landholders, and lifestyle landholders) provided a more nuanced classification than simply distinguishing between farmer/non-farmer. Race et al. (2012) used data for primary occupation, property size and on-farm income to classify each landholder. Using this classification Race et al. (2012) identified important differences in the values and property management practices across the three cohorts.

For example, PTF were more likely to undertake measures to enhance native vegetation and do so on a larger proportion of their property than FTF. For the evaluation proposed we have assumed that these three landholder types reflect different OI groupings.

Each informant was initially classified as one of these three groups (i.e. FTF, PTF, NF) based on the research teams’ assessment of information gathered during the interviews. Given our intentions were to include a mix of FTF, PTF and NF landholders, we used this initial classification to ensure an appropriate mix of informants was included in the interviews. Those initial classifications were later refined as a result of more thorough analysis of interview data using a number of CIC dimensions, including self-categorization and behavioural involvement (indicated by time spent working on and off-property). In one instance, where an informant said he was a farmer and a truck-driver, he was classified as a PTF because of the time spent working off-property and the identification with two occupations. We defined NF as those landholders who do not identify as a farmer, own land mainly for lifestyle reasons, and generate little or no income from agriculture; PTF as those who identify partly as a farmer, earn a majority of their income from non-farm sources but have primary production as part of the motivation for owning their property; and FTF as those identifying as a farmer and having primary production as their main focus and who spend the majority of their current working week on farming related activities. As part of the process of selecting informants (see below), the research team continually reflected on the “balance” of informants across the three occupational identity groupings.
In each case study we interviewed five NF, five FTF and ten PTF. We oversampled PTF as we expected they would share characteristics with NF and FTF and be more difficult to classify. We selected two major agricultural regions as the locations for our case studies – one in the USA and Australia - as we wanted to explore the relevance of the CIC framework in different developed economy contexts. A description of those cases is provided below. The research team has considerable experience working in the selected Australian region, less in the USA region, but had no expectations of how the CIC would apply in either case.

**Background to USA case study**

The USA study site is located in the Midwestern state of Ohio. This site was selected as it was comparable to the Australian case study in terms of the mix of farming systems (e.g. dairy, cropping, livestock); location of rural areas within commuting distance of regional centres where there are opportunities for off-farm work; and an apparent mix of FTF, PTF and NF landholders. The research team’s knowledge of the two case studies suggested that the Ohio landholders might be more likely to emphasize and reflect Christian religious values but were uncertain about the implications of that difference.

The Ohio case study was located in Wayne County, approximately 60 miles (97 km) southwest (within commuting distance) of the city of Cleveland (2013 population of 390,000) [Map 6]. The city of Wooster (2013 population of 26,000) is in the middle of the 555 square mile (1,440 square km) area [Map 6] and provided a base for our research activities. In 2013, Wayne County had an estimated population of 115,071. While agriculture and other primary industries account for only a small proportion of total employment (4.2%) (U.S. Census Bureau, 2014), farmland accounts for 76% of all available land in the county (United States Department of Agriculture, 2014). Wayne County ranks first in milk, cattle and calves, oats and hay in terms of cash receipts for all Ohio counties (Department of Agricultural, 2012). Major industries in the area include education, health care and manufacturing. Wayne County is home to the world headquarters for JM Smucker Co. (a large food manufacturer) and has an active food processing cluster including the industry leader, Smuckers and PepsiCo (Wayne
Economic Development Council, 2014). Wooster receives 40 inches (1,019 mm) of rainfall and 30 inches (762 mm) of snow (Your Weather Service, 2014) per year.

Map 6 Study site locations

Background to Australian case study

The Australian study site is also a major agricultural area, and is part of the North Central region in the state of Victoria, Southeast Australia [Map 6]. The research team was contracted by the local watershed organisation to survey 2,000 rural landholders about their land management, including the influence of OI on their NRM practices. Interviews were conducted with residents of rural areas near the township of Echuca located on the Murray River. The local government area surrounding Echuca covers 1,747 square miles (4,526 square km), has a population of 37,769 with dairying, cropping and tourism as the main industries. Agriculture employs 13% of the workforce with 88% of land in the area used for agriculture (Australian Bureau of Statistics, 2014). The Echuca district is within a comfortable daily commuting distance to the large regional centre of Bendigo (population of about 83,000, 56 miles/90 kms from Echuca), while the large metropolitan centre of Melbourne can be accessed with a day-length return trip by road or train (95 miles/ 153 km from Bendigo). The Echuca district receives 17 inches (428 mm) of rainfall per year (Australian Government Bureau of Meterology, 2014).

Data collection and analysis

Semi-structured interviews were conducted in summer 2013 in the USA and in summer 2014 in Australia. In each location, initial contact was made with local
organizations to identify the first group of potential informants. In the USA those organizations included the Ohio Farm Bureau (provided contact details of FTF) and the Department of Geographic Information Systems (provided contact details for NF). In Australia, the North Central Catchment Management Authority and The Echuca-Moama Rotary Club provided contact details for PTF. From those lists the research team selected a small number of individuals to be interviewed, to ensure representation of participants across a variety of property size (ranging from 10 to 5,000 acres) and enterprise type (e.g. crop, livestock, recreation). The remaining interviewees were identified through a purposeful snowball sampling technique where the research team asked interviewees to identify other potential informants, and if possible, to contact those people to advise them that they might be approached for an interview. Most interviewees had been contacted by other informants preceding initial contact from the research team. For the USA case study the response rate was 47% (21/45); and in the Australian case study, the response rate was 57% (20/35) with an overall response rate of 51% (41/80). Landholders identified as potential informants were evaluated using criteria such as property size and enterprise type to ensure a cross section of landholders were included in each case study. The research team also ensured that women were represented in the sample of informants (35%, or 14/40).

Each interview lasted between one-half and three hours. Most interviews were conducted in the informants’ home; others were conducted in a public location. Using semi-structured interviews, we explored three broad topics: the CIC dimensions; previous and current occupations; and background information. We started each interview by asking the informant, “What do you do for a living?” followed by either “What does it mean to be a farmer?” (for those identifying as a farmer) or “Can you describe the importance of the role of, or influence of, a ‘farmer’ to you?” (for those identifying as non-farmers). These questions opened the dialogue to explore whether an individual identified as a farmer, the perceived similarity with other farmers and the level of certainty of their fit within this social category. Follow-up questions including “Do your ‘farming’ activities reflect a typical landholder in this area?” were used to explore the degree to which their activities directly implicated them as a farmer. Additional questions such as, “Do you see the mix of part-time farmers, full-time

7 One USA interview was ultimately discarded as the informant did not meet all criteria.
farmers, and non-farmers/lifestylers as having a role within the rural landscape?” were used to explore how the interviewees thought about themself and how they thought others viewed the collective identity of farmers. In general, interview questions relating to CIC dimensions closely followed the suggested operationalisations found in Ashmore et al. (2004).

A key objective of this study is to explore the extent that a farmer identity, or dimensions of a farmer identity, is an important part of the overall identity of all rural landholders, including PTF and lifestyle landholders. That knowledge would enable researchers to better understand the motivations of different landholders and provide advice to those seeking to engage rural landholders in sustainable agriculture and biodiversity conservation. For example, knowledge of the extent lifestyle landholders are motivated by the desire to produce food and fibre for themselves or others would appear useful for those endeavouring to engage rural landholders in soil conservation or around issues related to biosecurity.

The interviews were audio recorded and transcribed verbatim. Deductive coding was implemented utilizing QSR Nvivo 10 (Saldana, 2009). The first step was to confirm that the interviewee was properly classified as FTF, PTF and NF on the basis of our definitions and key CIC dimensions (see above). We then coded each transcript to identify text relevant to each CIC dimension. We then compared the coded text for informants within each landholder cohort to assess the extent there was a consistent pattern for each CIC element. Following the approach adopted for the analysis of data from the first phase of interviews in the USA, all informants within a case study cohort were ranked from 1 to 11\(^8\) on the relevance of each CIC dimension to them; 1 being no relevance to 11 being highly relevant. (One USA interview was ultimately discarded as the informant did not meet all criteria resulting in 10 PTF). While the initial decision was to assign each informant a unique score within each cohort, the realisation was that it was not always possible or accurate to assign unique scores in every case; this resulted in some informants being assigned the same rank.

\(^8\) A rank of 1 to 11 was used as 11 USA part-time farmers were interviewed in the first phase of the USA study. At this preliminary stage of data analysis the research team assigned each interviewee within a cohort a score.
Based on these ranking, we rated the ability or usefulness (‘very useful’, ‘useful’, ‘little use’, ‘no use/unhelpful’) of each CIC dimension to distinguish between individuals in each of the three OI types. A separate category of ‘potential use’ was also included to identify instances where there was a mix of assessments for a dimension across the three landholder types; the mixed responses generally included the full spectrum of uses (i.e. ‘very useful’ to ‘no use’). This process was repeated to cover the observed relationships between FTF/PTF, FTF/NF and PTF/NF. Dimensions classified as ‘very useful’ provided a clear distinction between cohorts, while those classified as ‘no use/unhelpful’ provided limited distinction between the cohorts. To test for reliability of the approach to coding, the research team completely re-coded two interviews three months after the initial coding was undertaken. The results of that recoding were that > 90% of interview content was assigned to the same nodes as in the initial coding.

**Findings**

Study informants in both countries held a similar mix of occupations and engaged in similar land uses with the Australian PTF owning larger parcels of land than PTF in the USA [Table 22]. Overall, FTF and PTF were more similar than expected. However, five of the seven CIC dimensions were able to distinguish between the three landholder cohorts [Table 23]. We anticipated that NF and FTF would be on opposite ends of the spectrum, but there are instances where the NF are very similar to the FTF and PTF (i.e. content and meaning; attachment and sense of interdependence). Yet on other dimensions, as expected, the NF and the FTF differ substantially. There was considerable overlap between the PTF and the other cohorts (e.g. evaluation).
<table>
<thead>
<tr>
<th>Site</th>
<th>Cohort*</th>
<th>n</th>
<th>Age (range)</th>
<th>Occupation</th>
<th>Primary land use</th>
<th>Median area owned (acres)</th>
<th>Range of area owned (acres)</th>
<th>On farm income as % total (range)</th>
<th>Labour time on property (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>FTF</td>
<td>5</td>
<td>36-55</td>
<td>Dairy, hog, crop farmer</td>
<td>Crops, livestock</td>
<td>876</td>
<td>280 – 2,500</td>
<td>70%-100%</td>
<td>80%-100%</td>
</tr>
<tr>
<td></td>
<td>PTF</td>
<td>10</td>
<td>29-63</td>
<td>Medical, education, transportation, finance, compliance</td>
<td>Crops, livestock, pasture, timber</td>
<td>80</td>
<td>10 - 400</td>
<td>0%-33%</td>
<td>1%-50%</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>5</td>
<td>50-70</td>
<td>Retiree, finance, repairman</td>
<td>Pasture, timber, recreation, leased</td>
<td>41</td>
<td>11 - 129</td>
<td>0%-5%</td>
<td>0%-10%</td>
</tr>
<tr>
<td>AU</td>
<td>FTF</td>
<td>5</td>
<td>40-87</td>
<td>Dairy, beef farmer</td>
<td>Crops, livestock</td>
<td>870</td>
<td>93 – 5,000</td>
<td>100%</td>
<td>70%-100%</td>
</tr>
<tr>
<td></td>
<td>PTF</td>
<td>10</td>
<td>44-78</td>
<td>Retiree, education, construction, farm worker, contractor</td>
<td>Crops, livestock, pasture</td>
<td>665</td>
<td>25 – 4,000</td>
<td>7%-90%</td>
<td>10%-80%</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td>5</td>
<td>41-77</td>
<td>Medical, education, law, finance</td>
<td>Livestock, pasture, leased</td>
<td>12</td>
<td>10 - 200</td>
<td>0%-12%</td>
<td>3%-60%</td>
</tr>
</tbody>
</table>

*FTF – full-time farmers, PTF – part-time farmers, NF – non-farmers.
Table 23 Qualitative assessment of the ability (usefulness) of the CIC dimensions to distinguish full-time, part-time and non-farmer rural landholders in Australia and the USA

<table>
<thead>
<tr>
<th>CIC Dimensions</th>
<th>NF v FTF</th>
<th></th>
<th>NF v PTF</th>
<th></th>
<th>FTF v PTF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USA</td>
<td>AU</td>
<td>USA</td>
<td>AU</td>
<td></td>
</tr>
<tr>
<td>Behavioural involvement</td>
<td>Very</td>
<td>Very</td>
<td>Very</td>
<td>Very</td>
<td>Little</td>
</tr>
<tr>
<td>Self-categorization</td>
<td>Very</td>
<td>Potential</td>
<td>Very</td>
<td>Potential</td>
<td>Useful</td>
</tr>
<tr>
<td>Importance</td>
<td>Very</td>
<td>Little</td>
<td>Very</td>
<td>Little</td>
<td>Little</td>
</tr>
<tr>
<td>Social embeddedness</td>
<td>Very</td>
<td>Little</td>
<td>Very</td>
<td>Little</td>
<td>Unhelpful</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Very</td>
<td>Unhelpful</td>
<td>Potential</td>
<td>Unhelpful</td>
<td>Useful</td>
</tr>
<tr>
<td>Content and meaning</td>
<td>Potential</td>
<td>Little</td>
<td>Potential</td>
<td>Little</td>
<td>Little</td>
</tr>
<tr>
<td>Attachment and sense of</td>
<td>Potential</td>
<td>Unhelpful</td>
<td>Potential</td>
<td>Unhelpful</td>
<td>Little</td>
</tr>
<tr>
<td>interdependence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Scale: Very useful, useful, little use, no use/unhelpful, potential use (mixed responses generally included the full spectrum of usefulness)
The CIC was effective in separating the cohorts in both countries, however the effectiveness of the dimensions varied. Overall, the behavioural involvement dimension appeared to be the most capable of distinguishing the landholder cohorts and in both case studies was able to distinguish the NF from both ‘farmer’ types [Table 23]. To demonstrate the type of responses received for this dimension, we provide some representative interview quotations:

*Right now we have sheep and beef cattle. We only have….we’re kind of small. We only have 2 beef cattle … and we have 6 head of sheep now (USA NF).*

*We farrow-to-finish hogs. This year we hope to sell about 70,000 hogs (USA FTF).*

*I’m farming 20 acres of grain – soybeans and corn – and then we have close to 30 acres of hay. I sharecrop some of it (USA PTF).*

*We are a part-time hobby farm and I personally am a handyman and I sort of do it part-time and the rest of the time I’m just messing around on the farm here and looking after the kids (AU NF).*

*We are share farmers/owners. So we own land and we own cows. We milk our [350] cows in his dairy with his cows … 2,500 acres is the holding for here (AU FTF).*

*There are three aspects to our business. There is the agriculture side …We have a dairy farm where we milk between 600 and 800 cows … we would farm 1,200 acres on the dairy farm - probably about 1,800 acres on the cereal … then there’s the construction … and earthmoving side[s] (AU PTF).*

Using our approach, it was more difficult to distinguish between the FTF and PTF as they engage in very similar activities. Differences within the classifications on some dimensions highlighted the importance of considering multiple dimensions when classifying landholders. For example, one AU PTF owns and manages 25 acres, while another AU PTF owns and manages 4,000 acres with the range of time spent working on property related activities between 10% - 80% for AU PTF.

In this study all of the FTF and PTF were involved in food production. Some of the FTF farmers were engaged in very intensive farming activities. For example, one of the USA FTF raises 70,000 hogs per year while an AU FTF milks 350 cows. PTF typically engaged in less time-intensive farming activities. However, the scale of enterprise varied across and between the FTF and PTF. For example, one USA PTF crops 50 acres while an AU
PTF crops 1,800 acres. This range in the scale of enterprises highlights the importance of relying on multiple dimensions to assess OI amongst rural landholders.

Self-categorization was the only dimension that enabled the research team to clearly distinguish between the three USA landholder cohorts. Our analysis revealed that the NF identified as having an occupational identity separate from farming, PTF listed farming and another occupation, and FTF listed farming as their occupation.

Representative quotations follow:

I would say that I would only be at best a hobby farmer because we are not making any money (USA NF).

I’m a full-time organic dairy farmer (USA FTF).

I tell them [strangers] I’m an operator/farmer/custom harvester (USA PTF).

Both USA FTF and PTF saw themselves as having a farmer identity. Some of those interviewed saw themselves as atypical in that they thought they were different to a typical farmer in their area in that they were more prepared to innovate, adopt more sustainable practices, and had different enterprise types or lifestyle:

I’ve always been an ‘outside the box thinker’ anyways... I’m not afraid to look at other opportunities, and so by going organic, that’s how I looked at it – there’s other opportunities to do stuff (USA FTF).

[I am] probably more proactive and I think probably more sustainable. If I’m looking at my immediate neighbours, one’s in a corn and soybean rotation and one had been in permanent pasture that they never mowed and never maintained. It was really pretty poor. You know they could barely raise nearly the number of animals that we do on a much larger piece (USA PTF).

Out of my friends who raise their own livestock, they usually have larger tracts of land (USA PTF).

Some people whenever you say ‘farmer’ say, ‘Oh, so you grow corn and beans in our area.’ So from that standpoint, I’m probably not... as that description becomes more narrow, I’m probably a hog farmer. ... So farmer, yes, but some people stereotype that, as you know, corn and soybeans in our area, and that’s what you do (USA FTF).

I have a tract of timber on the farm, it’s about 38 acres, so not your typical crop, but a crop none-the-less (USA PTF).

We’re just a conventional dairy...We are not Mennonite, we are as modern as any other farm there is in our lifestyle. ... who are just basically pretty conservative (USA PTF).
Other informants from both the FTF and PTF categories saw themselves as typical farmers in the area (“I’m just a normal guy – just a normal farmer” (USA FTF) and “A farmer is a farmer” (USA PTF)).

Despite the complexity illustrated above, applying the CIC enabled the research team to distinguish between the FTF and PTF to varying degrees [Table 23]. For instance, the dimension of evaluation was useful in separating the FTF and PTF. For example, one USA PTF said,

*The small niche [those who prefer organic/natural food] people aren’t happy. …People want to get healthier, and they’re willing to pay for a healthier food, a healthier... organic, more natural [product]*...

One USA FTF passionately refuted the need for the organic movement by stating,

*My farm is cleaner environmentally than it’s ever been in the history of this earth. Ever. Ever, bar none ... [and] we are raising the best products in the world. .... The people that say that genetically modified [crops are] terrible, and an uncharted path - they’re flat wrong. .... My wife is a surgical nurse and she says, ‘we live longer than we’ve ever lived.’ So how is the food that we are eating killing us?*

Using this same dimension, the Australian context yielded different results. Instead of separation, landholders were much more similar in their views. For example one AU PTF explained that “…in agriculture you look at different farmers and the progressive ones and the non-progressive ones ... and you are looking at the good ones and looking at the bad ones to see who’s doing what.” In the same way of grouping all farmers largely together, an AU FTF expressed,

*There’s a couple [of] organic farmers around ... they are always running short on grass and the cows don’t look that healthy. They fit in; no one would say, ‘oh, they are organic – I don’t want to talk to them.’ They would fit in all right.*

It was readily apparent the NF were very different to the PTF and FTF. None of the NF in this study saw themselves as typical farmers. One USA NF differentiated himself from other farmers by stating, “where a lot of other farmers, they farm right out to the edge of the ditch, but ... we leave an area ... to just grow up for habitat and wildlife” highlighting the perceived difference in conservation values and behaviours of NF and farmers. An AU informant initially self-identified as a ‘teacher’, and it was not until more of her story was revealed through an investigation of other CIC dimensions that it became apparent that she was indeed a PTF and not a NF. She spent a considerable
amount of time working on the property (i.e. behavioural involvement), identified as both a teacher and a farmer (i.e. self-categorization), and had a rich history of life on the farm (i.e. content and meaning).

Self-categorization, however, did not readily distinguish between the three landholder types in the Australian context where self-categorization was more effective in identifying full-time farmers (e.g. dairy farmer) than it was for the non-farmer and part-time farmer cohorts.

I’m a mobile farmer, I’m not just here – I do the best of both worlds. I do irrigation, I do dryland, I do everything...we classify ourselves as [hobby farmers] (AU NF).

I’m a dairy farmer (AU FTF).

When I’m at work in my office I probably would still spend on average three hours a day on the management of the farm even though I’m not physically here...but if I were to sit down and logged all the hours that I did in the management of this place than I would probably say it’s half (AU PTF).

One AU informant described how he did not feel he belonged to a local beef producers group as he was not a FTF as he perceived the other participants to be. However, a fellow member stated, “Awe, look. We’re really just part-time farmers and [when I] look around the room, we’re all hobby farmers.” The response from the AU NF was, “In other words, they [the beef producers group members] all regard themselves as needing to get income from off farm.” Many AU landholders believe they need to earn an income from off-property work to remain viable, increasing the similarities between landholders. Given our small sample size and the past reliance upon self-declaration to identify OI, we suggest self-categorization be included in future research.

The remaining five dimensions yielded varying results from ‘useful’ to ‘no use/unhelpful’ [Table 23]. In this research, the dimensions attachment and sense of interdependence and content and meaning appeared to have limited ability to separate the three landholder cohorts. Interviewees across the three farmer types appeared to have similar ties (i.e. to others in the agricultural industry, the dimension of social embeddedness) and share similar stories (i.e. family history of farming, the dimension of content and meaning). The dimensions of importance and social embeddedness provided varying levels of segregation between cohorts and generally
appeared to be more useful in the USA case [Table 23]. Finally, the dimension of evaluation demonstrated no ability to separate the three cohorts in the AU context, but was helpful in separating the cohorts in the USA context.

Gender can be a factor shaping a person’s identity (e.g. Reed 2003) and has been identified as an influence on land management practices (e.g. Petzelka and Marquart-Pyatt 2011). Gender was not a specific focus for this research but our analysis suggests that gender was not a significant influence. For example, male and female respondents provided similar explanations for owning their rural property (i.e. providing space, being close to nature, past experiences with rural land). There were no obvious differences between men and women in the extent of a farmer identity or within the cohorts, or differences between men and women on the various CIC dimensions. Of course, those differences may exist and may have been revealed if there was a larger number of female informants. The key point from this study is that the CIC was able to distinguish women who were FTF, PTF and NF. It should therefore be possible to explore the role of gender as an influence on farmer identity in subsequent qualitative or quantitative studies. Based on these results we suggest that researchers consider employing a reduced number of CIC dimensions. In the next section we suggest which of the seven CIC dimensions will be most useful in distinguishing between rural landholder cohorts and provide an example of how each dimension might be operationalised for a survey.

**Discussion and conclusion**

In this research the CIC was more useful in distinguishing pre-determined landholder cohorts in the USA than in Australia. While the CIC was able to distinguish NF from those who farm (PTF and FTF), it was less effective in discriminating between the two farming cohorts. Overall, the dimension of behavioural involvement was the most effective in separating the three landholder cohorts. Four dimensions (self-categorisation, behavioural involvement, importance and social embeddedness) were able to distinguish the farmers (PTF and FTF) from the NF but were less effective in separating the farming cohorts (PTF and FTF). For example, the commonly applied approach of self-categorization did not readily distinguish between the three landholder types in the Australian context but did separate informants in the USA.
context. These results highlight the importance of relying on multiple dimensions to assess OI amongst rural landholders.

Table 24 CIC dimensions suggested for future quantitative studies with examples of survey items

<table>
<thead>
<tr>
<th>CIC dimension</th>
<th>Sample statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioural involvement</td>
<td>“State the total area of rural land you own” or “Estimate the average number of hours you spent per week working on farming/property related activities.”</td>
</tr>
<tr>
<td>Self-categorization</td>
<td>“I very much identify with agricultural producers in my district.”</td>
</tr>
<tr>
<td>Importance</td>
<td>“In a typical day, I very seldom think about being a part of the larger group of agricultural producers.”</td>
</tr>
<tr>
<td>Social embeddedness</td>
<td>“Estimate the proportion of people you meet socially who you consider are either full-time or part-time farmers.”</td>
</tr>
<tr>
<td>Evaluation</td>
<td>“In general, I’m glad that I’m an agricultural producer.”</td>
</tr>
</tbody>
</table>

In this study, each of the seven dimensions enhanced our ability to describe the OI of interviewees and distinguish rural landholders in at least one of the case studies. Of course, other case studies may provide somewhat different results. We conclude by suggesting that based on this research that five dimensions (i.e., behavioural involvement; self-categorisation; importance; social embeddedness; evaluation) should provide a comprehensive set of dimensions for use in future research exploring the nature and role of OI in the NRM context. In Table 24 we list those five dimensions and provide sample survey items (but not response options) that could be used to explore parts of each dimension. In those cases where survey space is very limited, our results suggest that researchers intending to explore the role of OI amongst rural landholders should combine items measuring behavioural involvement with measures of self-categorization that are typically employed in the NRM context. We also encourage further research exploring the relevance of all seven CIC dimensions and the refinement of survey items consistent with Ashmore et al.’s (2004) proposed operationalisation to explore the nature and role of OI amongst rural landholders, including the influence of gender on farmer identity.
CHAPTER 4 RESULTS – RESEARCH QUESTION ONE C

The development and validation of a collective occupational identity construct (COIC) in a natural resource context

Abstract

The trend to multifunctional rural landscapes in developed economies is characterised by the contrasting values, land uses and land management practices of rural property owners. In agricultural regions, it seems these trends are, at least in part, an expression of the extent rural landholders identify as farmers. Investigation of these trends has been hampered by the absence of robust approaches to measuring occupational identity amongst rural landholders. Research discussed in this paper addresses that gap. The objective was to develop a valid, reliable and efficient measure of occupational identity. We did that using the collective identity construct (CIC) and adapted a widely accepted 17-item CIC scale to explore the extent rural landholders in south eastern Australia held a farmer identity. Drawing on a survey of 1939 rural landholders we assessed the reliability, validity and utility of that scale. Those tests resulted in a 12-item scale that we suggest provides a valid and reliable measure of occupational identity that can be applied in natural resource management contexts.

Approach

Study site, sample size and selection of landholders

The North Central Catchment Management Authority (NC CMA) region in Victoria, Australia was selected as the focus of this study. The NC CMA is one of nine regional NRM organisations responsible for developing and implementing watershed planning and management in the state of Victoria (Seymour and Ridley, 2005). The emergence of new spatially variable landscapes in Victoria has been examined (Barr, 2003; Barr et al., 2005). Barr has identified different ‘social landscapes’ across Victoria using

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Australian Bureau of Statistics (ABS) data at the Statistical Local Area scale. For Victoria, Barr et al. (2005) identify four ‘social landscapes’, including rural amenity, irrigation, agricultural production and rural transitional. His work illustrates the multifunctional nature of the NC CMA region. Within the NC CMA region Barr et al. (2005) identify all four social landscapes: production landscapes in the north of the region in areas along the Murray River; amenity landscapes in the central and southern parts of the region, irrigation and transitional landscapes. We believe the NC CMA region is broadly representative of the state of Victoria as it encompasses these different landscape types, including dryland and irrigation farming, rural amenity landscapes and regional towns, and covers a large area of Victoria.

The NC CMA region covers an area of about 30,000 square kilometres (11,583 square miles; 13% of Victoria), experiencing hot, dry summers and cool, wet winters. The region begins just north of the metropolitan fringe of Melbourne and extends through the regional city of Bendigo to the Murray River and the state border with New South Wales, which is about three hours drive from Melbourne [Map 7]. Extending from the foothills of the Great Dividing Range to the Murray River Floodplain, the region encompasses a wide range of land types and uses including areas of extensive irrigation, cropping, mixed farming and grazing with those living in the area for amenity values on the rise (North Central Catchment Management Authority, 2013). Population densities generally increase and property sizes decrease closer to Bendigo and Melbourne, as does the proportion of landholders who self-identify as farmers (Curtis & Mendham, 2015).
Eighty-seven percent of land in the NC CMA region is privately held and the NC CMA relies heavily on the contributions of individual landholders to achieve desired improvements in environmental conditions (North Central Catchment Management Authority, 2013). The research team was engaged by the NC CMA to survey rural landholders across the region to identify their NRM issues and the values, beliefs, personal norms and attitudes influencing their management practices; and to gather data to inform evaluation of the impact of NC CMA interventions over time on rural landholders’ knowledge and management practices.

Local government area (LGA) ratepayer lists (similar to property tax records in the USA) were used to identify rural properties greater than 10 hectares (25 acres). The 10 ha threshold is accepted in Australia as a way of separating rural and urban land use (State Government of Victoria, 2013). A total of 2,000 landholders were selected to receive the survey based on a random sample drawn from the complete list in the LGA databases. The questionnaires were administered following methodologies developed in prior studies targeting rural landholders in other watersheds across Australia (Curtis et al., 2005; Mendham and Curtis, 2010).
A total of 1,939 surveys were delivered with 794 returned surveys and 296 blanks, declines and/or return to senders. This led to an overall response rate of 48.3%. Most (83.4%, n=593) respondents were male with 16.6% (n=118) being female. The age of respondents ranged from 23-91 years of age with a median age of 59 years old. The median property size was 253 hectares (625 acres). One quarter of respondents (23%, n = 165) owned less than 40 ha (99 acres) with the largest percentage of respondents (37%, n = 270) owning greater than 480 ha (1,186 acres).

Non-response bias was tested using one of three methods proposed by Armstrong and Overton (1977) - comparison with known values for the population. Non-response bias was tested by comparing survey data for four items with data for the NC CMA region collected by the ABS through their farm surveys. The four topics of comparable data were the mean age of respondents, gender, property size, and participation in landcare employing a 95% confidence interval as the test. The results of those analyses suggest the survey respondents are representative of the wider cohort of rural landholders in the region. The mean age of respondents in the ABS survey was 55.7 years, which was just outside of the sample parameters, Mean=58.7 years [57.9 - 59.6]. The percentage of male respondents in the ABS survey was 86%, within the sample parameters, 83.4% males [80.4%-86%] of this survey. The mean property size in the ABS survey was 537.3 ha (1,328 acres) - within the sample parameters, Mean=584.1 ha [524.6-643.7]. In the ABS survey, 31.7% of respondents were involved in landcare, just outside the sample parameters, 35.9% [32.4%-39.4%]. While there are items where scores for the ABS data fall outside the 95% confidence interval, the differences between the two data sets are minor. The ABS survey excludes landholders who produce less than $5,000 in the estimated value of agricultural output from their property; that filter was not applied to the NC CMA survey sample.

Survey format

The 12-page B5 survey booklet covered eleven topics. In addition to those identified above there were items exploring long-term plans for the property; trust in the NC CMA; values; beliefs; attitudes; occupational identity; and personal and farm background, including property size, ownership of multiple properties, age, length of residence, participation in local organisations and self-classification as Full-time
farmer, Part-time farmer or Non-farmer. Apart from the CIC scale, almost all other survey items had been employed in other regional-scale surveys implemented by the research team.

Seventeen items covering the seven CIC dimensions, developed by Ashmore et al. (2004), were adapted to measure a farmer collective identity and included in the survey [Table 25]. As part of the research process, semi-structured interviews were conducted with landholders in a case study in the United States and another in the NC CMA region of Australia to explore the salience of each CIC dimension and gain insights into how each item might best be framed in the Australian context. Five of the seven CIC dimensions were found to be relevant to rural landholders (Groth et al., In Press). After the interviews were conducted, three workshops were held with landholders in Australia to pretest the draft survey, with a focus on the CIC items. Those workshops resulted in item revisions, including replacing the term ‘farmer’ with ‘agricultural producer’ in most items. As there is significant heterogeneity in farmer types, the term ‘agricultural producer’ was used to encompass a range of ‘farming’ identities, and avoid focusing on any one specific type of farmer. The term ‘farmer’ was still present in an item directing respondents to choose a descriptor (full-time farmer, part-time farmer, non-farmer) that best described their occupational identity and another item that asked respondents to estimate the proportion of people they met socially who they consider to be either full-time or part-time farmers.

Most of the items exploring the CIC used a Likert-type scale with respondents asked to select from: (1) strongly disagree; (2) disagree; (3) neutral; (4) agree; (5) strongly agree; (6) not applicable. A small number of items included in the CIC provided for an open-ended response (i.e. items J-L, Q in Table 25) and responses for those items were recoded into five categories. For example, a ‘natural Jenks’ test (using ArcGIS) was implemented to find the natural breaks in the data distribution for item J. Five categories for item K were determined based upon input from NC CMA staff and item L was subdivided based on state standards of working hours. A small proportion of respondents (2%-14%) selected the ‘not applicable’ option for the CIC items (i.e. items A-I, M-P in Table 25); these items were recoded from ‘6’ to ‘0’ and those respondents were included in the subsequent analyses.
Missing values

More than 95% of respondents completed 13 of the 17 CIC items included in the survey. Nonresponse rates were higher for four items: item J (7.3%), K (8.2%), L (11%) and Q (35.8%) were the exceptions. With missing data for more than a third of respondents, item Q was removed from further assessment of scale validity and reliability. A number of reasons could have contributed to the high occurrence of missing data for this item including the item format (open-ended) and placement (near the end of the survey). Little’s missing completely at random (MCAR) tests confirmed that the data was MCAR (p>.05).

The research team was reluctant to exclude the remaining items from scale development and evaluated a number of possible ways to address the issue of missing data. The research team addressed items with missing values greater than 5%. As Vaske (2008) explains, when data are missing at random, this problem is ‘typically not serious’.

As explained above, in a different survey item (i.e. not part of the CIC scale), respondents were asked to indicate if they were a full-time farmer, part-time farmer or non-farmer. Over half of the respondents to this item said they were a full-time farmer (52%, n = 402), almost a third (30%, n = 229) identified as a part-time farmer and just under one in five said they were a non-farmer (18%, n = 142). Proportions tests indicated insufficient N’s of missing values in each category, and given the small percentage of missing responses, we opted to follow the approach suggested by Vaske (2008) using the solution of random assignment within groups to avoid bias when replacing missing values. The missing values for items J, K and L were replaced using the random assignment within group (i.e. full-time farmer, part-time farmer, non-farmer cohorts) solution, which utilises the median of nearby points. Three points above and three points below the missing value were used to ascertain the new values sorted by cohort. The following missing values were replaced in each item per cohort: item J, 13 non-farmer, 8 part-time farmer, and 18 full-time farmer; item K, 9 non-farmer, 9 part-time farmer, and 29 full-time farmer; item L, 16 non-farmer, 22 part-time farmer, and 28 full-time farmer. A small number of cases (n=21) could not be
replaced using this method. Median values per cohort did not change after implementing this approach to replacing missing values.

**Data Analysis: tests to be applied**

Validity is the process of assessing whether “researchers see what they think they see” (Flick, 2009) and is “crucial from the standpoint of theory development” (Crano and Brewer, 2002). Judgments of validity are subject to criticism and may change over time. One form of validation is the use of content validity, which addresses whether the different aspects or components of a concept included in a definition of that concept are addressed in a research instrument, or scale in this case (de Vaus, 1991). Construct validity measures how well a variable meets theoretical expectations (de Vaus, 1991). One form of construct validity is convergent validity and is achieved by measuring how well a variable meets theoretical expectations. Here, variables thought to be linked to a concept are expected to be correlated (Vaske, 2008).

Reliability is the ability of a measure to produce consistent results (Field, 2013). Scale reliability was evaluated through the use of statistical testing. A Cronbach alpha level of 0.7 was used as the threshold for including items in the scale and an inter-item correlation coefficient value of 0.3 as the threshold for determining that scale items were assessing different concepts (de Vaus, 1991). Items with inter-item correlations less than 0.3 were removed from the scale. Scale items that met the above criteria were analysed using exploratory factor analysis to determine the number of components that the scale items were measuring. Data were analysed using IBM SPSS 20 statistical analysis software.

This next section presents the results of evaluations of the reliability of the remaining 16 survey items expected to form an OI scale for use with rural landholders in an NRM context. Reliability is considered before addressing questions about validity. In addressing reliability and validity, results are also presented for analyses where scores on the revised CIC are compared with accepted proxy measures assessing OI of rural landholders; and finally, the newly created collective occupational identity construct (COIC) is tested by assessing if it can distinguish between a full-time farmer, part-time farmer and non-farmer as would be expected.
Results

Reliability of survey items to form a collective occupational identity construct scale

Testing the internal consistency of the 16 survey items revealed an overall Cronbach alpha level of .920 (n=736) using listwise deletion. Thirteen items exceeded the minimum reliability requirements having lower alpha levels if that item is deleted and corrected item-total correlations above the recommended 0.3 [Table 25]; three items (N-P) did not meet those specifications. Survey items N-Q either partly or entirely explore three CIC dimensions: evaluation (1 item), importance (1 item) and content and meaning (2 items). Without these items the revised 13-item scale had a Cronbach alpha level of .934 (n=749); most items exceeded the minimum accepted levels and appear to form a reliable scale with the exception of two items (J and M) in which the alpha level rose by .001 and are further scrutinized in factor analysis.
Table 25 Survey items used for testing the reliability of a collective occupational identity construct scale*  

<table>
<thead>
<tr>
<th>Item</th>
<th>Survey items</th>
<th>Corrected item-total correlation</th>
<th>Cronbach alpha if item deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>16 items</td>
<td>13 items</td>
</tr>
<tr>
<td>A</td>
<td>I very much identify with agricultural producers in my district</td>
<td>.759</td>
<td>.750</td>
</tr>
<tr>
<td>B</td>
<td>In general, I’m glad that I’m an agricultural producer</td>
<td>.818</td>
<td>.822</td>
</tr>
<tr>
<td>C</td>
<td>Being a part of the larger group of agricultural producers is an important reflection of who I am</td>
<td>.788</td>
<td>.797</td>
</tr>
<tr>
<td>D</td>
<td>What happens to agricultural producers as a whole will have an effect on what happens in my life</td>
<td>.598</td>
<td>.587</td>
</tr>
<tr>
<td>E</td>
<td>I have a strong sense of belonging or attachment to other agricultural producers</td>
<td>.804</td>
<td>.809</td>
</tr>
<tr>
<td>F</td>
<td>When someone criticises agricultural producers, it feels like a personal insult</td>
<td>.725</td>
<td>.718</td>
</tr>
<tr>
<td>G</td>
<td>My regular social contacts and relationships are with other agricultural producers</td>
<td>.771</td>
<td>.782</td>
</tr>
<tr>
<td>H</td>
<td>My agricultural production activities distinguish me from those who are not agricultural producers</td>
<td>.722</td>
<td>.725</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>I</td>
<td>I consider myself to be a typical agricultural producer in this</td>
<td>.795</td>
<td>.813</td>
</tr>
<tr>
<td></td>
<td>area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>What is the proportion of people you met socially who you</td>
<td>.497</td>
<td>.511</td>
</tr>
<tr>
<td></td>
<td>consider either a full or part-time farmer?^b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>What is the total area of rural land you own?^b</td>
<td>.600</td>
<td>.618</td>
</tr>
<tr>
<td>L</td>
<td>Estimate the average number of hours per week that you</td>
<td>.605</td>
<td>.625</td>
</tr>
<tr>
<td></td>
<td>worked on farming/property related activities over the past</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 months^b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>In a typical day, I very seldom think about being a part of the</td>
<td>.503</td>
<td>.505</td>
</tr>
<tr>
<td></td>
<td>larger group of agricultural producers^c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>In general, others respect agricultural producers</td>
<td>.267</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>The economic position of agricultural producers has</td>
<td>.298</td>
<td></td>
</tr>
<tr>
<td></td>
<td>worsened a lot over time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>The social position of agricultural producers has improved a</td>
<td>.251</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lot over time^c</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q. What two pieces of information would you share with someone you met for the first time informally?

a. Cronbach alpha of 16 CIC items = .920 and of 13 CIC items = .934
b. Items have been re-coded from a continuous variable into a 5-point Likert scale.
c. Reverse coded before analysis.
d. Re-coded from open ended to 5-point Likert scale with a distribution of responses between 1 (neither piece of information is related to a farmer identity) and 5 (both pieces of information are directly related to a farmer identity).

Shading indicates items included in final COIC scale.
Exploratory Factor Analysis

Principal components factor analysis (PCA) was conducted to confirm whether items should be included in the scale; 749 cases were included in the analysis. The correlation matrix revealed that one item (Item M in Table 25) had less than the typical relationship\(^\text{10}\) and it was therefore removed from the scale before continued analysis.

PCA was then performed on the remaining 12 CIC survey items with oblique rotation; 754 valid cases with means generally centred, which is desirable in scale development, were included in the analysis (DeVellis, 2003). The correlations are generally strong with values greater than 0.5 among most items. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .948\(^\text{11}\), and all KMO values for individual items were greater than .925, which is well above the acceptable limit of 0.5 (Field, 2013). One component had an eigenvalue over Kaiser’s criterion of 1 and explained 59.1% of the variance. The scree plot justified retaining one component as only one component was to the left of the point of inflexion. Multicollinearity was not detected – no items correlated very highly ($r > 0.8$) (Field, 2013). These results suggest that all 12 CIC survey items represent aspects of a farmer occupational identity. Respondents with higher scores can be assumed to have a stronger farmer identity than those scoring lower scores. The possible range of COIC scores is from 0-60.

In summary, the revised 12-item scale [Table 26] address six of the seven CIC dimensions. Two items (i.e. O and P in Table 25) addressing the social and economic position of agricultural producers within the dimension of content and meaning did not meet tests for reliability and were removed from the 16-item scale. Three other items (i.e. M, N and Q in Table 25) were also removed, but the dimensions they address are still represented by other, more reliable scale items. The final 12-item scale does not fully represent the dimensions of evaluation and importance. Removing the five unreliable items meant that the elements of implicit importance (dimension of importance) and public regard (dimension of evaluation) were also removed.


Nevertheless, six of the CIC dimensions are still represented in the final scale. Table 26 lists the dimensions and their sub-elements as represented in the final 12-item scale.

<table>
<thead>
<tr>
<th>Number of items</th>
<th>Dimension</th>
<th>Elements included</th>
</tr>
</thead>
</table>
| 3               | Self-categorisation | (1) Placing self in social category  
(1) Perceived certainty of self-identification  
(1) Goodness of fit / perceived similarity / prototypicality |
| 2               | Behavioural involvement | --- |
| 1               | Evaluation | (1) Private regard  
(0) Public regard |
| 1               | Importance | (1) Explicit importance  
(0) Implicit importance |
| 2               | Social embeddedness | --- |
| 3               | Attachment & sense of interdependence | (1) Interdependence / mutual fate  
(1) Attachment / affective commitment  
(1) Interconnection of self and others |
| 0               | Content and meaning | (0) Ideology  
(0) Narrative: collective identity story  
(0) Narrative: group story  
(0) Self-attributed characteristics |
Validity of the collective occupational identity construct scale

The original 17-item scale satisfied the criterion of content validity in that items were included to address all seven dimensions found in the widely accepted and theoretically sound CIC developed by Ashmore et al. (2004). For example, the survey item ‘I very much identify with agricultural producers in my district’ [item A in Table 25] addresses how much a person classifies him/herself as an agriculture producer, and examines the CIC dimension of self-categorisation.

In addition, our testing reveals that variables predicted to be related to the COIC are indeed correlated (convergent validity) [Table 27]. For example property size (p<.001, r = 0.7) and time spent on the property (p<.001, r = 0.7) are both highly correlated and exhibit a large effect size on the COIC. The results of these analyses appear to confirm the validity of the scale.

<table>
<thead>
<tr>
<th>Survey Items</th>
<th>Correlation coefficient with COIC score ( (r_s)^a )</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property size</td>
<td>.694***</td>
<td>709</td>
</tr>
<tr>
<td>Time spent working on property</td>
<td>.733***</td>
<td>692</td>
</tr>
<tr>
<td>Time spent in paid off-property work</td>
<td>-.340***</td>
<td>638</td>
</tr>
<tr>
<td>Net property profit</td>
<td>.335***</td>
<td>391</td>
</tr>
<tr>
<td>Membership affiliation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local landcare group</td>
<td>.219***</td>
<td>708</td>
</tr>
<tr>
<td>Local commodity group (e.g. Flockcare, Cropcare, Best Wool)</td>
<td>.284***</td>
<td>710</td>
</tr>
<tr>
<td>Local soil health group</td>
<td>.260***</td>
<td>709</td>
</tr>
<tr>
<td>Land use / enterprise type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cropping</td>
<td>.632***</td>
<td>687</td>
</tr>
<tr>
<td>Pasture</td>
<td>.579***</td>
<td>687</td>
</tr>
<tr>
<td>Beef cattle</td>
<td>.190***</td>
<td>634</td>
</tr>
<tr>
<td>Sheep</td>
<td>.512***</td>
<td>669</td>
</tr>
</tbody>
</table>
Testing the COIC scale against self-declaration into 3 types of landholders

Construct validity can also be explored by testing for hypothesized relationships between groups. Crano and Brewer (2002) propose that the ‘known groups’ method is the most common way to achieve this validation. Here, a measure of the proposed construct is applied to different groups of people who are known to differ on an attribute that is the focus of the instrument; if the scale works, then these groups will have very different scores (Crano and Brewer, 2002).

To test for construct validity, a Kruskal-Wallis test revealed statistically significant differences in farmer identity levels (COIC scores) across the three landholder cohorts was as expected (full-time farmer, n = 393; part-time farmer, n = 224; non-farmer, n = 134), $\chi^2 (2, n = 751) = 448.618$, $p < .000$. That is, the full-time farmer group recorded a higher median score (Md = 47) than either the part-time farmer group (Md = 37) or the non-farmer group (Md = 17). The effect size between cohorts is considered medium to large [Table 28].

Table 28 Calculating effect sizes for pairwise comparisons of landholder cohort and COIC scores

<table>
<thead>
<tr>
<th>Comparison</th>
<th>z</th>
<th>$\sqrt{N}$</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF vs. PTF</td>
<td>-8.210***</td>
<td>18.921</td>
<td>-.434</td>
</tr>
<tr>
<td>NF vs. FTF</td>
<td>-19.868***</td>
<td>22.956</td>
<td>-.865</td>
</tr>
<tr>
<td>PTF vs. FTF</td>
<td>-13.031***</td>
<td>24.839</td>
<td>-.525</td>
</tr>
</tbody>
</table>

Note: Non-farmer (NF), part-time farmer (PTF), full-time farmer (FTF)
*p<.05, **p<.01, ***p<.001
a Effect size: $r = 0.1$, small effect; 0.3, medium effect; 0.5, large effect (Field, 2013)
Discussion and Conclusions

The trend to multifunctional rural landscapes in developed economies is characterised by the contrasting values, land uses and land management practices of rural property owners. There are many types of landowners with different motivations for owning property (e.g. Moon and Cocklin, 2011; Sorice et al., 2014), including space and connecting with nature. In agricultural regions, it seems these trends are, at least in part, an expression of the extent rural landholders identify as farmers. There is now considerable evidence that occupational identity influences the management and land use of rural landholders. Investigation of these trends has been hampered by the absence of robust approaches to measuring occupational identity amongst rural landholders. We adapted and tested a widely accepted and theoretically sound scale to address that gap. This was the first attempt to assess the opportunity to use the CIC in the NRM context. In our research we drew upon the work of Stoner et al. (2011), who in turn had drawn upon the work of Ashmore et al. (2004) and others, to develop a scale to assess identity, but their work was not focussed on a farmer occupation.

After various tests for reliability and validity we identified a 12-item scale that we have labelled the COIC. The COIC embraces six of the seven CIC dimensions, including the core dimension of self-categorisation. Interestingly, Stoner et al. (2011) developed a scale that incorporated the same six dimensions that this research also found to be relevant (e.g. reliable and valid). Many of the proxy variables used in the past to identify landholder types were correlated with individual COIC scores. For example, there were expected relationships between property size, time spent working on and off property, returning a profit, membership affiliation and land use / enterprise type and COIC scale scores. COIC, developed in this research, was able to effectively distinguish landholders based upon those measures. Importantly, the final collective identity scale (COIC) was able to differentiate between respondents who self-declared as full-time, part-time and non-farmer landholders. Again those relationships were as expected.

Development of the items included in the survey was informed by an initial phase of qualitative research in the United States and Australia. Analysis of landholder interviews in the United States suggests that the COIC can be adapted by researchers exploring the nature and role of occupational identity in NRM in that country. Having
said that, analysis of the Australian survey data led to the removal of items exploring the dimension of “content and meaning” that were part of the Ashmore et al. (2004) CIC. In both previous (e.g. Stoner et al. (2011)) and present research, the dimension “content and meaning” has not been included in the development of a scale.

An important next step is to explore ways to measure “content and meaning” to see if it is possible to include that dimension in a reliable and valid survey instrument. Ashmore et al. (2004) did note that the best approach to this dimension may be (and has been) by using qualitative approaches, including interviews. Additional research is needed to undertake quantitative studies in the USA to assess whether all CIC dimensions can be included in a reliable and valid COIC scale for use in the USA.

This research drew on data for a large sample (n=1,939) of rural landholders and established that the COIC was a reliable and valid measure of farmer identity in a region that in many areas, can be described as multifunctional (Barr, 2003; Barr et al., 2005) and is typical of many regions in south eastern Australia. For this reason, we believe we can extrapolate our findings to the rest of Victoria. Nevertheless, further regional studies that include the COIC or a revised version will need to be undertaken and similar tests for reliability and validity undertaken to test the extent the scale “works” in other contexts.

There may also be opportunities to consider other measures of the CIC elements (and therefore dimensions). For example, in this study there are correlations between enterprise types / land uses and COIC scale scores, suggesting that items that include those variables may contribute to a “better” COIC. Unlike previous efforts with a very specific focus (e.g. irrigators) this scale does not employ such direct measures of arriving at occupational identity. Instead, we have formulated the survey statements in a way that could be easily administered to landscapes that are facing rural transition – be it in Australia, the United States or other nations with developed economies.

We suggest that based on this research, six dimensions (i.e. behavioural involvement, self-categorisation, importance, social embeddedness, evaluation, attachment and affective commitment) provide a comprehensive set of dimensions grounded in sound theory for use in future research exploring the nature and role of occupational identity in the NRM context. In turn, we suggest the 12-item COIC provides a valid and reliable
scale for use by NRM researchers. However, where survey space is limited, researchers should consider combining items measuring behavioural involvement with the measures of self-categorisation that are more typically employed in NRM.

Previous research has employed a host of variables to classify landholders. However, the lack of a consistent framework between studies limits our ability to compare landholders across economic, social and environmental conditions. Non-farmers or those concerned with living a rural lifestyle are increasing and need to be engaged. This cohort has largely been ignored by agencies in the past who placed a greater attention on the farming cohort. The COIC framework provides a consistent approach to measuring identity and will allow a direct comparison of landholders, ensuring that recommendations for best practices are correctly tailored to the array of landholders in a given area.

We conclude by suggesting that researchers can employ the COIC to develop theory-based typologies of landholders which would address what we see as a major weakness in many of the typologies previously developed. At the same time, soundly based typologies that include measures of values, beliefs, personal norms and attitudes and some of the “levers” that NRM practitioners employ, such as platforms and processes that engage and build human and social capital, may lead to heuristics that provide useful guidance to NRM practitioners.
CHAPTER 5 RESULTS – RESEARCH QUESTION TWO

Examining the agricultural producer identity: Utilising the collective occupational identity construct to create a typology and profile of rural landholders in Victoria, Australia\textsuperscript{12}

Abstract

Multifunctional rural landscapes are often characterized by contrasting values, land uses and land management practices of rural property owners. In agricultural regions, it seems these trends are, at least in part, an expression of the extent rural landholders identify as farmers. Existing typologies of rural landholders seldom take into account occupational identity and are largely atheoretical. Research discussed in this paper addresses that gap. The objective was to apply the collective occupational identity construct (COIC) to address the challenges of profiling rural landholders and test its effectiveness at distinguishing between different types of landholders. A 12-item scale adapted from the collective identity construct (CIC) was used to explore the extent rural landholders in south eastern Australia held an agricultural producer identity. Cluster analysis resulted in the creation of four clusters of rural landholders with distinctive characteristics, suggesting the approach can provide researchers with a theoretically sound construct and practitioners with a useful tool as they attempt to better understand and engage rural landholders in sustainable agriculture.

Background and Approach

Background of study area

The Australia case study was located in the North Central region of the state of Victoria. The North Central covers 13% of Victoria and encompasses the range of landscapes and land uses typical of much of Victoria, including large areas of foothills and floodplains, dryland and irrigation farming supporting a variety of enterprises from cropping to sheep and cattle for meat, viticulture, horticulture and dairying. The area

\textsuperscript{12} This chapter has been submitted as Groth, T., Curtis, A., Mendham, E. & Toman, E. Submitted to Land Use Policy.
experiences a Mediterranean climate with warm dry summers and cool moist winters. The North Central contains areas within easy commuting distance of Melbourne and the large regional city of Bendigo as well as areas well outside commuting distance to those centres of employment and educational opportunities. That diversity has been reflected in characterisations of the social landscapes in the North Central by Barr et al. (2005). Those authors identified four social landscapes within Victoria and specifically within the North Central region (including production, amenity, irrigation and transitional landscapes) (Barr et al., 2005). To the extent that the North Central is typical of other regions in Victoria, the typology developed should have wider relevance in south eastern Australia.

NRM in the North Central region is coordinated by the North Central Catchment Management Authority (CMA), one of nine regional NRM organisations or CMA established by the Victorian Government with responsibility for developing and implementing watershed planning and management (Seymour and Ridley, 2005). A key goal for Victoria’s CMA is to improve the condition of specific environmental assets, including those that underpin profitable agriculture. In the North Central the priority assets are native vegetation, waterways and wetlands. This is a challenging mission. We live in an increasingly modified environment and NRM practitioners are often attempting to address wicked problems where the way forward and the end goal are problematic. CMA typically have limited ability (agency) to accomplish their goals without the support of other stakeholders, especially the landholders who own most of the rural land in the state and directly influence the condition of soil, water and biodiversity assets.

As explained earlier, engaging rural landholders in NRM is challenging, in part because of the heterogeneity of landholders, but also because of the different objectives of engagement. For example, at various times the North Central CMA will set out to engage rural landholders to:

1. gather information from landholders to inform priority setting;
2. raise awareness of sustainable agriculture and NRM and of the role of the CMA;
3. respond to concerns about emerging issues, including those related to topics such as the impacts of pest plants and animals, declining soil health, and the social acceptability of environmental works; and

4. recruit participants to CMA initiatives, including funded projects that will undertake environmental work or set out to influence the land use and management of rural landholders.

Much of the appeal of rural landholder typologies is that they will provide useful heuristics for practitioners to employ as they set out to engage rural landholders.

**Approach to data collection**

With the support of the North Central CMA, the research team was able to access local government area (LGA) ratepayer lists (similar to property tax records in the USA) to identify the rural property owners to include in our sampling frame. Only owners of properties greater than 10 hectares (25 acres) were included. A sample of 2,200 properties was selected at random from the total of 23,147 rural property owners on the 14 LGA ratepayer lists. After removing owner’s listed more than once and public land, 1,939 surveys were posted. With 794 returned surveys (296 blanks, declines and/or return to senders) the overall response rate was 48.3%. The questionnaires were administered following the approach developed in prior studies targeting rural landholders in other watersheds across Australia (Curtis and Mendham, 2015). Survey respondents were compared to all landholders across the North Central CMA using data collected by Australian Bureau of Statistics Agricultural Surveys. Age, gender, property size and Landcare (local organisation) membership were very similar for the two cohorts.

As a precursor to the survey, semi-structured interviews were conducted with landholders in the North Central and in the USA case study in Ohio. Those interviews gathered data to test the salience of each CIC dimension, and in the Australian case study, to gain insights into how the survey items might best be expressed.

The 16 page A4 survey booklet covered eleven topics including items exploring long-term plans for the property; trust in the North Central CMA; values; beliefs; personal norms; attitudes; occupational identity; and personal and farm background, including
land use and management practices. The results section below includes profiles of the four landholder clusters identified using the COIC. While it is not possible to introduce and justify the inclusion of all survey items, some topics are more critical to the description of each cluster and will be briefly introduced.

Researchers typically distinguish between ‘assigned values’ and ‘held values’. Assigned values (i.e. attached values) are those that individuals attach to specific physical goods, activities or services, while ‘held’ values are ideas or principles that people hold as important to them (Lockwood, 1999), which are generally highly abstract, generic and conceptual, but guide personal action (McIntyre et al., 2008). Values-Belief-Norm Theory (VBN) is one theoretical approach to explain the relationship between values and behaviour. VBN explains an individual’s motivation for environmental behaviour and suggests that behaviour is derived from core elements of personality and belief structures, which inform specific beliefs about human-environmental interactions, consequences and an individual’s responsibility for taking action. VBN theory hypothesises that environmental behaviour is more likely if the individual believes that there may be adverse consequences for something that they value highly (Stern et al., 1993). A number of items included in the survey examine values, beliefs and norms, and the comparison of landholders in the different clusters, which is provided below, includes key differences on those attributes.

Table 29 Collective occupational identity construct (COIC) items and response categories

<table>
<thead>
<tr>
<th>Item</th>
<th>Survey items</th>
<th>Response categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>I very much identify with agricultural producers in my district</td>
<td>0 – Not applicable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 – Strongly disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – Disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – Neutral</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 – Agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 – Strongly agree</td>
</tr>
<tr>
<td>B</td>
<td>In general, I’m glad that I’m an agricultural producer</td>
<td>2 – Disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – Neutral</td>
</tr>
<tr>
<td>C</td>
<td>Being a part of the larger group of agricultural producers is an important reflection of who I am</td>
<td>4 – Agree</td>
</tr>
</tbody>
</table>

171
<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>What happens to agricultural producers as a whole will have an effect on what happens in my life</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>I have a strong sense of belonging or attachment to other agricultural producers</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>When someone criticises agricultural producers, it feels like a personal insult</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>My regular social contacts and relationships are with other agricultural producers</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>My agricultural production activities distinguish me from those who are not agricultural producers</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>I consider myself to be a typical agricultural producer in this area</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>What is the proportion of people you met socially during the month of February 2014 who you consider either a full or part-time farmer</td>
<td>1 - 0–10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – 11–35%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – 36–55%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 – 56–75%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 – 76–100%</td>
</tr>
<tr>
<td>K</td>
<td>What is the total area of rural land you own</td>
<td>1 – &lt;40 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – 4–120 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – 121–240 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 – 241–480 ha</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 – &gt; 480 ha</td>
</tr>
<tr>
<td>L</td>
<td>Estimate the average number of hours per week that you worked on farming/property related activities over the past 12 months</td>
<td>1 – &lt;16 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 – 17–34 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 – 35–50 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 – 51–69 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 – &gt;70 hrs</td>
</tr>
</tbody>
</table>
Analysis of survey data

Data analysis was undertaken using the SPSS statistics software program (version 20). Principal component analysis (PCA) was applied to responses to the 17-item CIC scale to identify a valid and reliable scale measuring a farmer collective identity (Groth et al., 2015). The resulting 12-item COIC [Table 2] scale was used to undertake a cluster analysis to identify groups of landholders with similar occupational identity.

Cluster analysis is an umbrella term for a set of techniques used to develop classification schemes and concepts in data analysis (Aldenderfer and Blashfield, 1984). The approach is widely used to establish structure within large data sets. Wide ranges of both clustering algorithms and similarity/distance measures are available. Following the advice of Hair et al. (2010), a range of algorithms was trialled for the input variables using the SPSS statistical package. First a hierarchical technique was used to generate cluster solutions and establish the appropriate number of clusters followed by a non-hierarchical method (K-means algorithm).

A hierarchical cluster procedure was implemented using several different clustering algorithm’s and score transformation. Although several algorithms were tried, the hierarchical method of Wards Linkage provided the best “fit” to the dataset in terms of appropriate number and internal homogeneity of clusters. The agglomerative coefficients were compared to determine where the largest increase in coefficients occurred. Following the Ward clustering method, using the squared Euclidean distance measure, four clusters were indicated. The K-means, non-hierarchical procedure was then implemented using the directive of four clusters. The dataset was reordered and the K-means cluster analysis was rerun. Less than 5% of the observations were reassigned to a new cluster; this low percentage indicates that the clustering is a very stable solution.

---

13 Methods tried were the Ward’s, between groups, and furthest distance linkage methods, using combinations of both Euclidean and squared Euclidean distance as the distance measure. All input variables were transformed where necessary to give a normal distribution.

14 Z-score transformation converts each raw data score into a standardised value with a mean of 0 and a standard deviation of 1 eliminating any bias introduced by differences in scales used in the analysis. Both a 5 and 6-point Likert scale were used. Z-score transformation resulted in the same number of clusters as the original unstandardised scores.

15 Hair et al. (2010) states that a very stable solution would be produced with less than 10% of observations being reassigned to a different group; a stable solution would result with between 10%-

173
Results

Cluster formation

A Kruskal-Wallis H Test revealed statistically significant differences at the p<.001 level between the four clusters, although post-hoc tests indicated that clusters 1 and 2 were similar on five of the 12 items. Cluster sizes ranged from 78 observations (cluster 1) to 359 observations (cluster 4). The observed differences in median values per survey items indicate that each of the four clusters exhibit distinctive characteristics. No cluster contains less than 10% of observations. All clusters were retained as this preliminary assessment was sufficiently favourable to indicate the use of non-hierarchical clustering. The next step was to employ non-hierarchical analysis (Hair et al., 2010) and the results were consistent with those described. Indeed the cluster sizes were very similar to those found in the hierarchical procedure. Plotted median values of the 12 COIC items indicate the distinctiveness of the four clusters [Figure 5 and Table 29].

![Median values by cluster using K-means method](image)

Figure 5 Median values by cluster using K-means method

20% being reassigned; and a somewhat stable solution between 20%-25% of observation being reassigned to a different cluster than the initial one.
**Cluster interpretation**

The title and interpretation of the clusters are based on the resulting 12 COIC items (Hair et al., 2010). Cluster one has 78 (10%) observations and is distinguished by the lowest median values on nine of the 12 items [Figure 5]. The respondents in this cluster do not see themselves as agricultural producers and do not relate to other agricultural producers in their district. Individuals in this cluster interact with people they classify as farmers at less than 10% of all social meetings, own very small properties (median 20 ha) of land and spend limited time working on their property (<16 hours/week). This cluster has been assigned the ‘non-farmers’ title.

Cluster two has 85 (11%) observations. Respondents in this cluster are neutral about their identification with agricultural producers and spend less than 10% of their social meetings with those they consider farmers, own small plots of land (median 31 ha) and work minimally on their property (<16 hours/week). This cluster has been assigned the ‘hobby farmers’ title.

Cluster three is the second to largest cluster with 232 (31%) observations. The respondents in this cluster identify as agricultural producers. However, less than one-third of their relationships are with other farmers, they own relatively small properties (median 100 ha) and are typically not engaged full-time in on-property work (e.g. between 17-34 hours on their property every week). This cluster has been assigned the ‘part-time farmers’ title.

Cluster four is the largest cluster with 359 (48%) observations. The respondents in this cluster have a strong belief about, and are glad, they are agricultural producers. Out of all of the clusters, the respondents in this cluster spend the most time with other farmers, the most time in on-property work (e.g. 51-69 hours/week) and own the largest areas of farm land (median 770 ha). This cluster has been assigned the title of ‘full-time farmers’.

A Kruskal-Wallis H Test was used to test for differences between clusters and selected items in the larger survey while a Chi-Square test was used with nominal item responses. The following section profiles the clusters in more detail while highlighting
significant findings from the analysis of survey data addressing values, beliefs, attitudes, and risk interpretation.

**Cluster profiling**

**Cluster 1: ‘Non-farmers’**

The ‘non-farmers’ cluster had the smallest median hectares owned (20 hectares) and these landholders were more likely to focus on the recreation and biodiversity values of their property [Tables 30 and 31]. The ‘non-farmers’ cluster exhibits the highest level of concern regarding environmental values (e.g. importance of native vegetation) and biospheric values (e.g. the protection and prevention of harm to the environment) [Table 31]. ‘Non-farmers’ were more likely to own properties that were located within the North Central CMA biodiversity asset category as opposed to a waterway or wetland asset, and have the highest percentage of property dedicated to native vegetation and tree planting [Table 30]. This cluster also has the largest percentage of their property dedicated to recreation [Table 30] and places the highest importance on the recreational values of their property (although the mean value is not statistically different to cluster 2) [Table 31]. Consistent with those data, the ‘non-farmers’ cluster is most in agreement with the statements that ‘working on the property is a welcome break from my normal occupation’ and their property is ‘a place where I can escape the pressures of life’ [Table 31].

The ‘non-farmers’ cluster appears to be the least likely to be motivated by economic or production values associated with their land. For example, this cluster was the least likely to give a high rating to the values of ‘sense of accomplishment from building / maintaining a viable business’ and ‘sense of accomplishment from producing food and fibre for others’ [Table 31]. Almost all respondents in this cohort reported no on-property profit but 60% reported earned off-property income [Table 32]. Those in the ‘non-farmers’ cluster were also the least likely to say ‘Yes’ they had family members interested in taking on their property [Table 32], suggesting there was little commitment to farming as a way of life or family livelihood. Those in the ‘non-farmers’ cluster were also most likely to agree that landholders should mitigate their land management practices to minimise harm to the environment and agree that humans were inducing climate change that are impacting humans [Table 33].
Cluster 2: ‘Hobby farmers’

As might be expected, the ‘hobby farmers’ cluster operate small properties (median of 31 ha) [Table 30] and these landholders are more similar to the ‘non-farmers’ cluster where the focus is on conservation and recreation values compared to the ‘part-time’ and full-time’ clusters where the focus is increasingly on production and business aspects of property ownership [Tables 30 and 31]. As with ‘non-farmers’, ‘hobby farmers’ had a strong focus on environmental values (held and attached), although slightly less than the ‘non-farmers’. The landholder duty of care is slightly weaker than for the ‘non-farmers’, but ‘hobby farmers’ are also more likely than the ‘part-time’ and ‘full-time’ to believe that land should be managed in ways that will not cause foreseeable harm to the environment [Table 33]. Similar to the ‘non-farmers’ this cluster believes that climate change results from human activity and that inaction to address climate change will lead to dire consequences [Table 33].

‘Hobby farmers’ are more likely than the ‘non-farmers’ to emphasise the importance of ‘the productive value of the soil on my property’ and the ‘sense of accomplishment from producing food and fibre for others’ [Table 31], and agree with the norm ‘I feel a personal responsibility to maintain my soil’s productive capacity’ [Table 33].

Compared to the ‘non-farmers’ cluster, ‘hobby farmers’ own larger properties [Table 30], are more likely to be resident owners, more likely to report an on-property profit [Table 32] and have a smaller proportion of their property under native vegetation or set aside for recreation [Table 30].

Compared to the ‘part-time’ and ‘full-time’ clusters, ‘hobby farmers’ are less likely to report an on-property profit or be members of local organisations such as Landcare groups [Table 32]. ‘Hobby farmers’ were also more likely to be women than those in the ‘part-time’ and ‘full-time’ farmer clusters [Table 32].
### Table 30 Comparison of clusters by land area and use

<table>
<thead>
<tr>
<th>Survey item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land size (median ha)</td>
<td>20</td>
<td>31</td>
<td>100</td>
<td>769.5</td>
</tr>
<tr>
<td>Percentage of land set aside for recreation (%)</td>
<td>13.5</td>
<td>2.0</td>
<td>0.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Percentage of land planted in trees (%)</td>
<td>10.6</td>
<td>2.4</td>
<td>1.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Percentage of land in remnant vegetation (%)</td>
<td>40.2</td>
<td>12.2</td>
<td>6.7</td>
<td>6.8</td>
</tr>
<tr>
<td>Biodiversity asset classification (within cluster %)</td>
<td>88.0</td>
<td>83.7</td>
<td>69.9</td>
<td>57.0</td>
</tr>
<tr>
<td>(within asset classification %)</td>
<td>20.5</td>
<td>16.7</td>
<td>27.0</td>
<td>35.8</td>
</tr>
<tr>
<td>Waterway asset classification (within cluster %)</td>
<td>6.0</td>
<td>11.6</td>
<td>18.1</td>
<td>17.8</td>
</tr>
<tr>
<td>(within asset classification %)</td>
<td>6.4</td>
<td>10.6</td>
<td>31.9</td>
<td>51.1</td>
</tr>
<tr>
<td>Wetland asset classification (within cluster %)</td>
<td>6.0</td>
<td>4.7</td>
<td>12.0</td>
<td>25.2</td>
</tr>
<tr>
<td>(within asset classification %)</td>
<td>6.1</td>
<td>4.1</td>
<td>20.4</td>
<td>69.4</td>
</tr>
</tbody>
</table>

- **a.** n values: 1 (n = 63 - 70); 2 (n = 73 - 82); 3 (n = 192 - 223); 4 (n = 295 - 334)
- **b.** Areas providing ecosystem goods and services underpinning the health of water and land, flora and fauna, and communities as identified by the NC CMA.
- **c.** Areas adjacent to a natural waterway as identified by the NC CMA.
- **d.** Areas temporarily or permanently waterlogged or inundated with water as identified by the NC CMA.
Table 31 Summary of differences in values between clusters

<table>
<thead>
<tr>
<th>Survey item</th>
<th>Mean scores&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Assigned Values</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Recreation</strong></td>
<td></td>
</tr>
<tr>
<td>A place for recreation</td>
<td>4.1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Lifestyle</strong></td>
<td></td>
</tr>
<tr>
<td>Working on the property is a welcome break</td>
<td>3.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>from my normal occupation</td>
<td></td>
</tr>
<tr>
<td>A great place to raise a family</td>
<td>2.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>A place where I can escape the pressures of life</td>
<td>4.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td></td>
</tr>
<tr>
<td>An asset that will fund my retirement</td>
<td>2.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Sense of accomplishment from building /</td>
<td>1.9&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>maintaining a viable business</td>
<td></td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
</tr>
<tr>
<td>Sense of accomplishment from producing food and</td>
<td>1.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>fibre for others</td>
<td></td>
</tr>
<tr>
<td>The productive value of the soil on my property</td>
<td>2.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
### Environmental

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to pass on a healthier environment for future generations</td>
<td>4.0\textsuperscript{ab}</td>
<td>3.8\textsuperscript{a}</td>
<td>4.2\textsuperscript{a}</td>
<td>4.4\textsuperscript{b}</td>
<td>19.91</td>
</tr>
<tr>
<td>Native vegetation provides habitat for birds and animals</td>
<td>4.6\textsuperscript{a}</td>
<td>4.1\textsuperscript{a}</td>
<td>3.7\textsuperscript{b}</td>
<td>3.5\textsuperscript{b}</td>
<td>70.46</td>
</tr>
<tr>
<td>Native vegetation makes the property an attractive place to live</td>
<td>4.1\textsuperscript{a}</td>
<td>3.9\textsuperscript{ab}</td>
<td>3.6\textsuperscript{bc}</td>
<td>3.4\textsuperscript{c}</td>
<td>25.41</td>
</tr>
</tbody>
</table>

### Held Values

**Tradition / family**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looking after my family and their needs</td>
<td>4.2\textsuperscript{a}</td>
<td>4.5\textsuperscript{ab}</td>
<td>4.6\textsuperscript{a}</td>
<td>4.8\textsuperscript{b}</td>
<td>18.88</td>
</tr>
</tbody>
</table>

**Biospheric value**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protecting the environment and preserving nature</td>
<td>4.3\textsuperscript{a}</td>
<td>4.1\textsuperscript{ab}</td>
<td>3.9\textsuperscript{b}</td>
<td>3.8\textsuperscript{b}</td>
<td>16.64</td>
</tr>
<tr>
<td>Preventing pollution and protecting natural resources</td>
<td>4.3\textsuperscript{a}</td>
<td>4.2\textsuperscript{ab}</td>
<td>3.9\textsuperscript{b}</td>
<td>3.9\textsuperscript{b}</td>
<td>16.13</td>
</tr>
<tr>
<td>Respecting the earth and living in harmony with other species</td>
<td>4.3\textsuperscript{a}</td>
<td>4.0\textsuperscript{ab}</td>
<td>3.8\textsuperscript{bc}</td>
<td>3.6\textsuperscript{c}</td>
<td>34.37</td>
</tr>
</tbody>
</table>

**Egoistic values**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having power and being able to lead others</td>
<td>2.1\textsuperscript{a}</td>
<td>2.1\textsuperscript{a}</td>
<td>2.4\textsuperscript{ab}</td>
<td>2.6\textsuperscript{b}</td>
<td>16.88</td>
</tr>
<tr>
<td>Creating wealth and striving for a financially profitable business</td>
<td>2.3\textsuperscript{a}</td>
<td>2.9\textsuperscript{a}</td>
<td>3.7\textsuperscript{b}</td>
<td>4.2\textsuperscript{c}</td>
<td>169.24</td>
</tr>
</tbody>
</table>

---

- a. Scores ranged from 1 = not important to 5 = very important
- b. n values: 1 (n = 74 - 76); 2 (n = 80 - 81); 3 (n = 215 - 220); 4 (n = 311 - 347). Means (reading across the rows) with different superscripts are significantly different using the adjusted Bonferroni correction.
- c. Values significant at p < .05
<table>
<thead>
<tr>
<th>Survey items</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
<th>$\chi^2$\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family members interested in taking over property in future (%)</td>
<td>No</td>
<td>27.3</td>
<td>34.9</td>
<td>27.6</td>
<td>15.2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>27.3</td>
<td>33.7</td>
<td>37.1</td>
<td>56.6</td>
</tr>
<tr>
<td></td>
<td>Unsure/ too early to know</td>
<td>45.5</td>
<td>31.3</td>
<td>35.3</td>
<td>28.2</td>
</tr>
<tr>
<td>Property is principal place of residence (%)</td>
<td></td>
<td>39.7</td>
<td>64.6</td>
<td>66.5</td>
<td>85.0</td>
</tr>
<tr>
<td>Female (%)</td>
<td></td>
<td>44.3</td>
<td>35.5</td>
<td>14.0</td>
<td>7.8</td>
</tr>
<tr>
<td>A member or involved with a local Landcare group (%)</td>
<td></td>
<td>23.3</td>
<td>21.5</td>
<td>31.8</td>
<td>44.9</td>
</tr>
<tr>
<td>Returned a net property profit in 2012/2013 (%)</td>
<td></td>
<td>5.4</td>
<td>24.7</td>
<td>42.2</td>
<td>85.4</td>
</tr>
<tr>
<td>Received a net off-property income in 2012/2013 (%)</td>
<td></td>
<td>60.5</td>
<td>72.9</td>
<td>68.9</td>
<td>49.1</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Values significant at $p < .05$
\textsuperscript{b} Six degrees of freedom
\textsuperscript{c} Three degrees of freedom
### Table 33 Summary of differences in beliefs, attitudes, values, risk interpretation and climate change beliefs between clusters

<table>
<thead>
<tr>
<th>Survey item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>H^c</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beliefs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearing native vegetation since European settlement has substantially reduced the extent and variety of native vegetation in this district</td>
<td>3.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>26.61</td>
</tr>
<tr>
<td><strong>Landholder duty of care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is fair that the wider community asks landholders to manage their land in ways that will not cause foreseeable harm to the environment</td>
<td>3.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.7&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>3.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>25.11</td>
</tr>
<tr>
<td><strong>Personal norm</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel a personal responsibility to maintain my soil’s productive capacity</td>
<td>2.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4.4&lt;sup&gt;c&lt;/sup&gt;</td>
<td>124.12</td>
</tr>
<tr>
<td><strong>Attitudes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural landholders should have the right to discharge water from their property, even if that action impacts on others</td>
<td>2.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.2&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.3&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>2.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>14.76</td>
</tr>
<tr>
<td>Risk</td>
<td>Scores</td>
<td>Significance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
<td>--------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative impacts of cropping/grazing waterways &amp; wetlands can be fixed</td>
<td>2.8&lt;sup&gt;a&lt;/sup&gt; 3.3&lt;sup&gt;ab&lt;/sup&gt; 3.6&lt;sup&gt;ab&lt;/sup&gt; 3.6&lt;sup&gt;b&lt;/sup&gt; 8.08</td>
<td>Means (reading across the rows) with different superscripts are significantly different using the adjusted Bonferroni correction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I usually view risks as a challenge to embrace</td>
<td>3.2&lt;sup&gt;ab&lt;/sup&gt; 3.1&lt;sup&gt;b&lt;/sup&gt; 3.4&lt;sup&gt;b&lt;/sup&gt; 3.6&lt;sup&gt;a&lt;/sup&gt; 20.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate change</td>
<td></td>
<td>c. Values significant at p &lt; .05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human activities are influencing changes in climate</td>
<td>4.0&lt;sup&gt;a&lt;/sup&gt; 3.8&lt;sup&gt;ab&lt;/sup&gt; 3.5&lt;sup&gt;b&lt;/sup&gt; 3.2&lt;sup&gt;c&lt;/sup&gt; 42.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is not too late to take action to address climate change</td>
<td>3.6&lt;sup&gt;a&lt;/sup&gt; 3.6&lt;sup&gt;a&lt;/sup&gt; 3.6&lt;sup&gt;a&lt;/sup&gt; 3.1&lt;sup&gt;b&lt;/sup&gt; 31.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If we do nothing, climate change will have dire consequences for all living things, including humans</td>
<td>3.8&lt;sup&gt;a&lt;/sup&gt; 3.7&lt;sup&gt;ab&lt;/sup&gt; 3.3&lt;sup&gt;b&lt;/sup&gt; 2.8&lt;sup&gt;c&lt;/sup&gt; 63.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Scores ranged from 1 = strongly disagree to 5 = strongly agree with 0 = not applicable / don’t know
b. n values: 1 (n = 74 - 76); 2 (n = 80 - 82); 3 (n = 221 - 226); 4 (n = 337 - 346). Means (reading across the rows) with different superscripts are significantly different using the adjusted Bonferroni correction.

c. Values significant at p < .05
Cluster 3: ‘Part-time farmers’

The ‘part-time farmers’ own much larger properties (median 100 ha) than the ‘non-farmers’ or ‘part-time farmers, but much smaller properties than the ‘full-time farmers’ [Table 30]. However, in many ways the ‘part-time farmers’ are more similar to ‘full-time’ farmers than to ‘hobby farmers’. A key difference is in the extent the ‘part-time farmers’ focus upon production rather than conservation or recreation which is the principal focus of ‘hobby farmers’ [Tables 30, 31 & 33]. For example, this cluster places higher value on building a viable business and producing food and fibre in comparison to the ‘non’ and ‘hobby farmers’. In addition, ‘part-time farmers’ are more likely to earn a profit from their property, be involved in Landcare and have family interested in taking over the property in the future compared to both ‘hobby farmers’ and the ‘non-farmers’ [Table 32]. ‘Part-time farmers’ are more likely to favour stronger private property rights (e.g. agree that landholders should have the right to discharge water from their property even if that result in negative impacts on others) and demonstrated less commitment to a duty of care for biodiversity than the ‘non’ or ‘hobby farmers’ [Table 33]. Similarly, ‘part-time farmers’ are more optimistic than ‘full-time farmers’ that actions can be taken to address climate change [Table 33].

Cluster 4: ‘Full-time farmers’

‘Full-time farmers’ owned the largest properties (median 770 ha) and were most likely to report a profit and to indicate they were planning for family succession for their properties [Table 32]. This cluster places the greatest emphasis on their commitment to family (e.g. ‘ability to pass on a healthier environment for future generations’ and ‘looking after my family and their needs’ [Table 31]. ‘Full-time farmers’ emphasised the importance of values related to production of food and fibre, building a viable business and supporting their families even more so than ‘part-time farmers’ [Table 31]. ‘Full-time farmers’ were less likely to emphasise recreation or environmental values than the other clusters [Table 31]. Indeed, ‘full-time farmers’ set aside the smallest proportion of their properties for recreation and had planted the smallest proportion of their properties to trees (i.e. as part of revegetation) [Table 30].

‘Full-time farmers’ were the least likely of all clusters to acknowledge the negative environmental impact resulting from clearing of native vegetation by past generations.
to establish farms; or to accept that rural landholders have a duty of care for biodiversity [Table 33]. ‘Full-time farmers’ were also most likely to emphasise private property rights [Table 33]. ‘Full-time farmers’ are also most likely to be resident owners, be men and members of their local Landcare group [Table 32].

**Discussion and conclusion**

Most existing rural landholder typologies are atheoretical and have been based on variables largely unrelated to occupation, which appears to be an increasingly important influence on management and land use in multifunctional landscapes. This paper addressed that gap by drawing upon identity theory and the collective identity construct. The research team applied a collective occupational identity construct (COIC) scale to develop a sound, useful typology of rural landholders. The research team used a large, spatially-referenced data set that embraced the full range of landholders (i.e. across enterprises, land types, and social landscapes) typical of much of the Australian state of Victoria.

Using the COIC scale we were able to identify distinct landholder clusters using a process that conforms to best-practice (i.e. meets various tests for validity and reliability). The four-cluster typology appears to provide a useful way of interpreting the complex diversity amongst rural landholders in the North Central region, and other similar multifunctional landscapes in south eastern Australia. In this case, our approach identified four clusters. The first cluster, ‘non-farmers’, is similar to the ‘lifestyle-oriented’ and ‘professional lifestyler’ categories identified by Morrison and Lockwood (2014). ‘Non-farmers’ give a high priority to the biodiversity and recreational values of their property and exhibit limited to no interest in farming as a business or involvement in farming-related social activities. Those in the second cluster, labelled ‘hobby farmers’ also place little importance on agricultural production and appear to be similar to those identified by Abrams and Bliss (2012) as ‘amenity owners’ or by Holloway (2002) as ‘hobby farmers’. The ‘hobby farmers’, however, place less emphasis on the recreational aspects of their property than ‘non-farmers’. In previous research, these two landholder groups have often been lumped together (e.g. Jongeneel et al., 2008; Race et al., 2012). Compared to the ‘non-farmers’ and ‘hobby farmers’, the ‘part-time farmers’ identify as agricultural producers, but are ambivalent about whether being a part of the agricultural producer group is an
important reflection of who they are. By comparison with the ‘non-farmers’ and
‘hobby farmers’ clusters, ‘part-time farmers’ are much less focused on the biodiversity
and recreational values of their properties. The ‘part-time farmers’ cluster shares
similarities with those identified in Sorice et al. (2014) ‘multiple-use landowner’ group
in that they are production oriented but have more diverse motives than ‘full-time
farmers’. ‘Full-time farmers’ are proud to be agriculture producers and are more
connected to other farmers than those in the other clusters. This cluster appears to be
similar to the ‘traditional farmer’ category identified by Morrison and Lockwood

As this brief discussion suggests, there are similarities between the typology that
emerged from this research in North Central Victoria and previous studies. Having said
that, we suggest that the application of the COIC in the North Central region
established ‘part-time farmers’ as an important cohort (i.e. 31% of all landholders) that
are very different to the ‘hobby farmers’. Indeed, in this study the ‘part-time farmers’
are more similar to ‘full-time farmers’ than they are to ‘hobby-farmers’. This finding
has important implications for those seeking to engage rural landholders in sustainable
agriculture, at least in south eastern Australia; and illustrates the potential for
application of the COIC to improve the capacity of researchers to explore trends in
multifunctional landscapes.

We now turn to a discussion of the usefulness of this four-cluster typology for NRM
practitioners, and in this case, staff of the North Central CMA. We suggest that the
four clusters meet the requirements of a useful heuristic that will enable CMA staff to
more effectively and efficiently engage rural landholders. Each of the four clusters
includes at least 10% of landholders in this study and, as demonstrated, the clusters
separate landholders into distinctive groupings that have sufficient internal
homogeneity to allow NRM practitioners to tailor their approaches to engagement
specifically to the characteristics of each category. An important point is that the
profiles of each cluster include information about the key influences on rural
landholder behaviour, including measures of values, beliefs, personal norms, trust and
attitudes; as well as information about the “levers” that NRM practitioners can
employ, such as the platforms (e.g. local organisations) and processes (trials, short
courses) that engage and build human and social capital. For example, if North Central
I CMA staff are seeking to engage rural landholders in a program focused on the eradication of blackberry, an introduced and highly invasive pest plant that readily displaces native vegetation along waterways and makes it very difficult to access waterways for recreation, approaches focused around appeals to biodiversity conservation and recreation values would be more likely to resonate with ‘hobby’ or ‘non-farmers’ than with the ‘full-time farmers’. However, ‘hobby’ or ‘non-farmers’ may be reluctant to undertake or accept conventional measures to control blackberry, such as the use of herbicides. On the other hand, ‘part-time’ and ‘full-time farmers’ are more likely to own the equipment and have the knowledge and skills to undertake control measures such as spraying, but will probably expect to be reimbursed for their costs if they are going to incur substantial expense, including for their time. Information in these cluster profiles would also be important if NRM practitioners are considering the extent of long-term commitment to on-ground work to control blackberries on or adjacent to private property.

State and regional NRM agencies across Australia have typically focused their efforts to engage rural landholders in sustainable agriculture and NRM on those who are farmers by occupation, or the ‘full-time farmers’ in this study (Curtis and Robertson, 2003; Curtis and Race, 2012). The assumption is that the ‘full-time farmers’ manage most of the land area. The ‘full-time farmers’ are also more likely to be part of existing networks and be engaged through programs the state and regional agencies have established. NRM agencies often work with ‘full-time farmers’ due to limited resources - both economic and personnel. Such agencies are generally aware that other landholders exist, but the strain on resources makes connecting to all landholder cohorts difficult. To the extent that engagement focuses on ‘full-time farmers’, opportunities to achieve important sustainable agriculture/ NRM objectives in a cost-effective way may be missed (Curtis and Robertson, 2003; Race et al., 2012). For example, while ‘non-farmers’ and ‘hobby-farmers’ represented 21.6% of all landholders in this study, they represented 37.2% of all landholders who own land identified as part of the biodiversity asset (principally remnant native vegetation) by the North Central CMA. Given the pro-biodiversity values and behaviours of landholders in these clusters, efforts to achieve biodiversity outcomes, particularly
over the long-term, might be better focussed on these clusters than those in the ‘part-time’ or ‘full-time’ clusters.

North Central, CMA staff now have access to profiles describing the four clusters and maps illustrating the distribution of each cluster across the 14 LGA and three environmental assets in their region. Those data are not available to all CMA in Victoria. We also acknowledge that there are differences across the Victorian regions, but suggest there are sufficient similarities that practitioners can apply the four cluster typology in the other regions. Our experience is that there is sufficient local knowledge amongst staff in the other CMA to identify the four clusters using readily available or observable proxy variables that form part of the profiles provided in the results section of the paper, including property size, enterprise type, time spent on/off property, and involvement with other farmers. That task should be undertaken as part of discussions by small teams focussed on specific initiatives.

In conclusion, we suggest that the COIC provides a theoretically sound basis for developing typologies of rural landholders and for investigating the influence of occupational identity on sustainable agriculture and NRM in multifunctional landscapes. While our experience with a US case study in Ohio suggests that the scale is likely to be applicable in that context, additional research applying the COIC outside south eastern Australia is needed to assess its utility in other multifunctional landscapes.
CHAPTER 6 RESULTS - RESEARCH QUESTION THREE

What is the nature of the relationship between farmer identity and the land management of rural landholders?

Introduction

There is a long list of possible influences on behaviour of landholders. Increasingly, research is showing that occupational identity influences landholder behaviour. Researchers have used identity to predict landholder behaviour and the resulting implications of various landholder identities for wider landscape change [see Chapter 1]. For example Burgess, et al. (2000) found that the strength of a farmer identity accounted for some resistance to a wetland agri-environmental scheme, while Burgess, et al. (2000) explored the relevance of the internalisation of a farmer identity on behaviour. These researchers used facets of a collective farmer identity (largely unrelated to the CIC) to explore the relationship between farmer identity and landholder behaviour.

This chapter explores the relationship between farmer identity, as measured by the COIC, and landholder behaviour. In this chapter, I present five models that cover a mix of production and conservation focussed practices that are promoted by governments and NRM organisations and widely accepted by farmers as best-practice (see below). To ensure applicability to our participants, we included both practices that were relevant to most landholders (i.e. non-specific) as well as specific practices that are likely more relevant to particular landholders. The following sections describe our analytical approach (including the identification of the dependent and independent variables, and the creation of a new variable), expected relationships between COIC and the five selected behaviours, the results of the general linear models, and a discussion of each.

Approach to analysis

Addressing potential bias in results

Property size has been used as a proxy for farmer identity. However, the frequency or time that landholders are likely to implement some practices is likely directly
influenced by property size. That is, landholders with larger property sizes are likely to spend more time implementing some practices than those who have smaller parcels simply as a result of the size of their ownership (e.g. controlling pest animals and non-crop weeds). To account for and minimize any bias, a number of adjustments were made to the data prior to analyses. Three dependent variables (‘area sown to perennial pasture and Lucerne’, ‘time spent controlling pest animals and non-crop weeds’, and ‘area with at least one lime application’) were recoded from a scale into a binary response as I expected them to be susceptible to bias. Any value greater than zero was coded as a ‘yes, have performed the activity’, and a response of zero retained the code of ‘no, have not performed the activity’. A fourth variable was recalculated as a proportion (i.e. area of native bush / grassland fenced to manage stock access).

These adjustments were meant to eliminate the potential bias introduced through the relationship between property size and implemented practice as an individual who reported having executed the activity, regardless of the extent, was classified in the same category as those who performed the behaviour extensively. To account for any bias that may be associated with length of land ownership, the practices addressed a range of specific time frames of ownership (further discussed below).

Selection of dependent variables

Five management practices were selected to explore the nature of the relationship between COIC and behaviour. Two common practices or behaviours were identified that would be relevant to most landholders, regardless of whether their farm enterprises had a cropping or grazing focus: (1) ‘area sown to perennial pasture and Lucerne’, and (2) ‘time spent controlling pest animals and non-crop weeds’. While most rural landholders could be expected to implement these practices (independent of the total area committed to the practice or total days spent as totals may be affected by property size - a proxy used in other studies for occupational identity), it seems reasonable to assume that non-farmers and hobby farmers might be less likely to implement these practices than either part-time or full-time farmers. Accordingly, we expected there would be a significant positive relationship between COIC scores and the implementation of these practices. Moreover, I expected the relationship between COIC scores and sowing perennial pasture and Lucerne would be stronger than the relationship between COIC scores and controlling pest animals and non-crop
weeds as these practices require considerable farming expertise and access to sophisticated equipment.

Two practices with a production focus were included and the expectation was those landholders who identified more readily as a farmer (and had a higher COIC score) would be more likely to have engaged in those practices. Those practices were: (1) ‘tested soils for nutrient status where fertiliser / soil conditioners were applied’, and (2) ‘area with at least one lime application’. It is assumed that landholders who had a higher productive focus (and had higher COIC scores) would be more likely to engage in activities that enhance soil productivity. The expectation therefore was for a significant positive relationship between COIC scores and implementation of these two practices.

A management practice with a biodiversity focus was also included: (1) ‘area of native bush / grassland fenced to manage stock access’. Most landholders would have some native bush/ grasslands on their property. In this research 78.5% (544/693) of respondents reported having remnant native vegetation (e.g. trees, grasslands, wetlands) on their property. The expectation was that those landholders with a higher regard for biodiversity and the amenity values of their property (and lower COIC scores) would be more likely to implement this practice. That is, there would be a significant negative relationship between COIC scores and the implementation of this practice. Having said that, other research (Curtis & Mendham, 2011; Curtis & Race, 2012) has produced what seem at first glance to be counterintuitive findings where farmers have implemented conservation practices at higher levels than non-farmer landholders. It seems that when farmers are engaged in platforms (e.g. Landcare groups) that establish powerful social norms and provide access to government funding and other resources, farmers will implement conservation practices and do so more than non-farmers.

As explained above, bias was addressed regarding property size and length of land ownership. These two topics were addressed through recoding variables and the selection of a range of length of land ownership statements. Specifically, three dependent variables were recoded: ‘area sown to perennial pasture and Lucerne’, ‘estimated time spent by you or others to control pest animals and non-crop weeds’,
and ‘area with at least one lime application’. The dependent variables were recoded from a scale pertaining to hectares or days into a binary response; any value greater than zero was coded as a ‘yes, have performed the activity’. A fourth dependent variable was recoded into an alternative continuous scale to account for the proportion of land fenced to manage stock access (‘area of native bush/grasslands fenced to manage stock access’). The original response was divided by the reported amount of total land owned allowing for the proportion of land fenced to be used in comparing landholders’ behaviour, and thus reducing bias introduced through property size. The final dependent variable included a ‘NA’ response. This was recoded into binary (yes/no; tested soils for nutrient status in paddocks where have applied fertiliser / soil conditioners in the past) with the ‘NA’ responses omitted from the logistic regression.

Additionally, the practices that addressed length of land ownership included a range of specific time frames of ownership to account for any bias that may be associated with length of land ownership. Three dependent variables related to practices engaged in over the full period of their management (i.e. ‘area of native bush / grasslands fenced to manage stock access’, ‘area sown to perennial pasture and Lucerne’, and ‘area with at least one lime application’). One variable accounted for practices engaged in over the last 5 years (i.e. ‘tested soils for nutrient status in paddocks where have applied fertiliser / soil conditioners in the past’), and one variable accounted for practices that were engaged in over the last 12 months (i.e. estimated time spent by you or others to control pest animals and non-crop weeds).

**Selection of independent variables**

Hair, et al. (2010) recommend an overall sample size of 400 or greater with a minimum of ten observations per parameter for each group within the dependent variable. This ratio was adopted in the selection of independent variables.

A range of independent variables was identified for inclusion in the models. The independent variables covered the following topics [see Appendix B for survey]: long-term plans for the property, assessment of issues, importance of property, view of issues, information sources, occupational identity (i.e. COIC score), knowledge items, risk and trust items, enterprise / land use mix, and background information.
The COIC score was the primary variable of interest and of critical importance to responding to the key research question. As a reminder, the COIC variable is a summated score of 12 survey items addressing six dimensions of a collective occupational identity. Other independent variables were selected for inclusion in each model based on their degree of relevance to the behaviour, previous research efforts warranted inclusion, and/or demonstrated a significant relationship with the dependent variable based on pairwise comparisons.

Survey items used in the development of new variables (i.e. items used to create the COIC variable and ‘knowledge of soils’ variable) were not used independently – these items are only found in the formation of the new variables. The ‘knowledge of soils’ variable [further discussed in a later section] incorporates responses to ten soil-related knowledge statements. A number of additional items included in the survey examine values, beliefs and norms [Table 34]. The majority of independent variables included in the general linear modelling addressed issues affecting a respondents local district and property, value items related to why the property is important to the respondent, respondent view items (including beliefs, confidence in recommended practices, and norms), and background information (e.g. previous behaviour) items, knowledge of soils and COIC.
<table>
<thead>
<tr>
<th>Item topic</th>
<th>Survey item</th>
<th>Item code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSIGNED VALUES</strong></td>
<td>Why your property is important to you</td>
<td></td>
</tr>
<tr>
<td>Learning</td>
<td>Opportunity to learn new things</td>
<td>q3new</td>
</tr>
<tr>
<td>Recreation</td>
<td>A place for recreation</td>
<td>q3rec</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Working on the property is a welcome break from my normal occupation</td>
<td>q3occ</td>
</tr>
<tr>
<td>Economic</td>
<td>An asset that will fund my retirement</td>
<td>q3ass</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>A great place to raise a family</td>
<td>q3fam</td>
</tr>
<tr>
<td>Production</td>
<td>Sense of accomplishment from producing food and fibre for others</td>
<td>q3ff</td>
</tr>
<tr>
<td>Environmental</td>
<td>Ability to pass on a healthier environment for future generations</td>
<td>q3gen</td>
</tr>
<tr>
<td>Economic</td>
<td>Sense of accomplishment from building/maintaining a viable business</td>
<td>q3bus</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>A place where I can escape the pressures of life</td>
<td>q3esc</td>
</tr>
<tr>
<td>Environmental</td>
<td>Native vegetation provides habitat for birds and animals</td>
<td>q3veg</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>An attractive place/area to live</td>
<td>q3att</td>
</tr>
<tr>
<td>Production</td>
<td>The productive value of the soil on my property</td>
<td>q3soil</td>
</tr>
<tr>
<td>Environmental</td>
<td>Native vegetation makes the property an attractive place to live</td>
<td>q3nat</td>
</tr>
</tbody>
</table>
HELD VALUES

The principles that guide your life

Tradition / family
Looking after my family and their needs

Altruistic value
Working for the welfare of others

Biospheric value
Protecting the environment and preserving nature

Egoistic value
Being influential and having an impact on other people and events

Altruistic value
Fostering equal opportunities for all community members

Biospheric value
Preventing pollution and protecting natural resources

Egoistic value
Having power and being able to lead others

Biospheric value
Respecting the earth and living in harmony with other species

Altruistic value
Caring for the weak and correcting social injustice

Egoistic value
Creating wealth and striving for a financially profitable business

Statements about your views

Beliefs
If landholders are informed in advance, it would be acceptable to cause minor floods for environmental purposes

Confidence in recommended practice
Soil testing is an essential first step in understanding soil condition

Beliefs
Clearing native vegetation since European settlement has substantially reduced the extent and variety of native vegetation in this district
Beliefs

If we are careful it is possible to pump ground water without affecting the integrity (water quality and level) of the aquifer

Confidence in recommended practice

The benefits of stubble retention outweigh problems arising from the practice

Confidence in recommended practice

The costs of applying lime to address soil acidity are justified by increased production

Confidence in recommended practice

The costs of establishing perennial pasture are justified by the returns

Confidence in recommended practice

The cost of willow removal is justified by improvements in the condition of river banks & river health

Confidence in recommended practice

Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking

Confidence in recommended practice

Fencing to manage stock access is an essential part of the work required to protect the health of waterways and wetlands

Confidence in recommended practice

Improvements in bank stability and vegetation condition justify the costs of watering stock off-stream

Personal norm

I feel a personal responsibility to be part of a soil health group

Personal norm

I feel a personal responsibility to maintain my soil’s productive capacity

Social norm

My local community expects landholders will use stubble management practices that prevent soil erosion

Landholder duty of care

It is fair that the wider community asks landholders to manage their land in ways that will not cause foreseeable harm to the environment
| Beliefs                                      | The ground water management plan for this area shares water fairly q4gw |
| Beliefs                                      | The increased allocation of water for the environment under the Murray Darling Basin Plan q4md will improve the health of waterways & wetlands |
| Beliefs                                      | The productivity of farm land is related to the health of nearby waterways & wetlands q4wet |
| Attitudes                                   | Landholders should have the right to harvest water that falls on their property, even if that q4act action impacts on others |
| Attitudes                                   | Aboriginal people should have the right to negotiate access with individual landholders to q4ab visit important cultural sites |
| Attitudes                                   | Rural landholders should have the right to discharge water from their property, even if that q4rur action impacts on others |
The survey items were tested for significant association with the dependent variables (five management practices) using Pearson’s Chi-Square. Each dependent variable was significantly associated with numerous independent variables. In many instances, the statistical relationships assisted in narrowing the items to be included for testing to adhere to the ratio proposed by Hair, et al. (2010). The statistical association, similarity of topic between dependent and independent variables, and previous use of similar items were the guidelines that I followed in selection of the independent variables.

Variables were checked for multicollinearity using correlations (e.g. correlation matrix) and variance inflation factor (VIF) to ensure multiple items were not strongly correlated. Variables with correlation values above 0.9, or where there were several correlations greater than 0.7, were removed, as such levels may be problematic Vaske (2008). Moreover, a number of items addressing soil knowledge were combined using principal components analysis (PCA) [Table 35]. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .932, exceeding the recommended value of .6 (Field, 2013) and Bartlett’s Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix. Some correlations between the included variables indicated potential multicollinearity with some r values greater than 0.7, however as Tabachnick and Fidell (2007) offer, one option for dealing with collinearity is to ignore it, “if the only goal of analysis is prediction” (p. 91). The knowledge of soils recoded item is only to be used for prediction in the models, and so further testing continued. None of the independent variable VIFs selected for testing exceeded Vaske’s (2008) recommended threshold of 4.0.

Principal components analysis utilizing promax rotation revealed the presence of one component with eigenvalue exceeding 1, explaining 63.1% of the variance [Table 36]. This was further supported by an inspection of the scree plot, which revealed one component to the left of the point of inflexion [Figure 6]. All variables had strong loadings on the one component.
<table>
<thead>
<tr>
<th>Knowledge of Soils</th>
<th>Component Matrix$^a$</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategies to maintain ground cover to minimise erosion in this area</td>
<td>0.657</td>
<td>0.432</td>
</tr>
<tr>
<td>How to establish introduced perennial pastures (e.g. Lucerne) in this area</td>
<td>0.760</td>
<td>0.578</td>
</tr>
<tr>
<td>The ability to identify acidic soils in this area</td>
<td>0.851</td>
<td>0.724</td>
</tr>
<tr>
<td>The processes leading to soil structure decline in this area</td>
<td>0.839</td>
<td>0.703</td>
</tr>
<tr>
<td>The role of soil carbon in maintaining soil health</td>
<td>0.748</td>
<td>0.560</td>
</tr>
<tr>
<td>How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off</td>
<td>0.823</td>
<td>0.677</td>
</tr>
<tr>
<td>Frequency &amp; rate of lime application to address soil acidity in this area</td>
<td>0.800</td>
<td>0.639</td>
</tr>
<tr>
<td>Frequency &amp; rate of fertiliser application to maintain productivity across the main soil types on your property</td>
<td>0.865</td>
<td>0.747</td>
</tr>
<tr>
<td>Frequency &amp; rate of spraying to implement minimum tillage in this area</td>
<td>0.816</td>
<td>0.665</td>
</tr>
<tr>
<td>The effect of fertiliser application on the persistence of native grasses in this area</td>
<td>0.761</td>
<td>0.580</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.  
$^a$ 1 component extracted.
Table 36 Total Variance explained by 'Knowledge of Soils' item

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>6.306</td>
<td>63.059</td>
</tr>
<tr>
<td>2</td>
<td>.749</td>
<td>7.490</td>
</tr>
<tr>
<td>3</td>
<td>.583</td>
<td>5.831</td>
</tr>
<tr>
<td>4</td>
<td>.521</td>
<td>5.215</td>
</tr>
<tr>
<td>5</td>
<td>.443</td>
<td>4.427</td>
</tr>
<tr>
<td>6</td>
<td>.409</td>
<td>4.094</td>
</tr>
<tr>
<td>7</td>
<td>.329</td>
<td>3.294</td>
</tr>
<tr>
<td>8</td>
<td>.283</td>
<td>2.833</td>
</tr>
<tr>
<td>9</td>
<td>.199</td>
<td>1.993</td>
</tr>
<tr>
<td>10</td>
<td>.176</td>
<td>1.764</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Figure 6 Knowledge of Soils scree plot

Approach to general linear model testing

Logistic and multiple regression were performed to assess the impact of factors included in the survey that were expected to contribute to respondents being more likely to report that they had implemented any of five selected land management practices (e.g. dependent variables). For the purpose of this research implementing a practice should be understood as a behaviour. Only survey respondents who selected ‘yes’ have or ‘no’ have not adopted a practice were included in analysis; respondents who selected that a practice was ‘not applicable’ were excluded from that particular practice adoption analysis. A number of independent variable input methods were trialled (e.g. ENTER method, stepwise Forward likelihood ratio (LR) and stepwise Backward LR entry methods); the ENTER method was ultimately selected. Stepwise methods are generally not recommended as variables included into models should be chosen based on previous research or theoretical assumptions and not simply based on statistical significance, and stepwise methods often incorrectly identify ‘the best set’ of predictor variables (Vaske, 2008).
Two ‘types’ of models were run. The first in which any item could be entered if it met the criteria of being relevant and/or previously tested (‘inclusive model’), and the second in which only relevant value-belief-norm (VBN) items plus an occupational identity item (e.g. COIC) (‘restrictive model’) were included. The VBN framework consists of five factors (i.e. values, general environmental beliefs, beliefs regarding adverse consequences to valued objects, beliefs regarding ascribed responsibility for adverse consequences, and personal norms to act) in a linked casual chain integration. While each variable is expected to directly affect the subsequent variable, it was impractical to include all variables in a chain for each behaviour in the survey owing to space limitations. For that reason, some chain variables present in the models are more intact than others.

The aim in testing two types of models was to assess the nature of the relationship of farmer identity and behaviour. Would COIC be a significant contributor to each model? Would it be the same in both types of models? I expected within the ‘inclusive’ models, that the COIC item may not achieve statistical significance; other items acting as proxies for occupational identity (e.g. knowledge of soils, attendance of field days/farm walks/demonstrations focused on soil health) could explain a similar variance within the model. Within the restrictive model, VBN theory suggests that VBN items mediate influences on behaviour, therefore restricting the type of items entered into the modelling could further explore the nature and strength of the relationship between COIC and behaviour. The strength of COIC may become increasingly apparent in the restricted model as some of the proxy variables for occupation would be omitted. The contribution of individual variables in both logistic and multiple regression is dependent on the other items entered into the model (Vaske, 2008) and the removal or addition of any item could result in a change in the variance contribution. I predicted that regardless of the items entered, COIC would contribute a unique variance in the models. In instances when the data is contradictory or is counterintuitive, supporting data is introduced to explain the relationship between the independent variable(s) and dependent variable.
Findings

An overview

The expectation was for a significant positive relationship between COIC scores and four of the five tested behaviours. Respondents having a stronger farmer identity (i.e. higher COIC score) were expected to be more likely to have engaged in sowing perennial pasture and Lucerne, controlling unwanted animals and weeds, testing soil nutrient status, and applying lime compared to those having a weaker farmer identity (i.e. lower COIC score). Pairwise analysis of COIC scores and each practise provided evidence of these expected relationships between COIC scores and sowing perennial pasture and Lucerne; controlling pest animals and non-crop weeds; testing soils for nutrient status where fertiliser / soil conditioners were previously applied; and having applied at least one lime application over the full period of their management [Table 37].

It was also expected that there would be a significant negative relationship between COIC scores and the practice of fencing native bush / grassland to manage stock access. The underlying assumption was that respondents with lower COIC scores would place a higher value on biodiversity and the aesthetic appeal of their properties than those with higher COIC scores (i.e. stronger farmer identity). That assumption was based on previous research findings (e.g. Klepeis, et al., 2009; Mendham, et al., 2012), and confirmed by the typology descriptions for full-time farmer/part-time farmer compared to hobby farmer/non-farmer. Pairwise analysis confirmed the expected trend but there was not a significant relationship between lower scores and being more likely to engage in this practice [Table 37].
Table 37 Results of Mann-Whitney U pairwise analyses testing assumed relationships between COIC scores and implementation of five selected farm management practices

<table>
<thead>
<tr>
<th>Practice/behaviour</th>
<th>Expected nature of direction of relationship with COIC</th>
<th>Results</th>
<th>As expected?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land sown to perennial pasture and Lucerne</td>
<td>Positive</td>
<td>Significant</td>
<td>Yes</td>
</tr>
<tr>
<td>Spent time controlling pest animals and non-crop weeds</td>
<td>Positive</td>
<td>Significant</td>
<td>Yes</td>
</tr>
<tr>
<td>Tested soils for nutrient status where fertiliser/soil conditioners were applied</td>
<td>Positive</td>
<td>Significant</td>
<td>Yes</td>
</tr>
<tr>
<td>Area with at least one lime application over the full period of management</td>
<td>Positive</td>
<td>Significant</td>
<td>Yes</td>
</tr>
<tr>
<td>Area of native bush/ grassland fenced to manage stock</td>
<td>Negative</td>
<td>Non-significant</td>
<td>No (^a)</td>
</tr>
</tbody>
</table>

\(^a\) Direction as expected; but only a trend.

Pairwise analysis is a result of comparing two groups and two items. This limited view provides evidence of a significant relationship between the items, but does not include the interaction with other items. I built on this preliminary analysis to complete more in-depth analysis of variables of interest. The value of general linear models is in the use of multiple independent variables on a single dependent variable while also taking into account some of the relationship between the independent variables. Two types of models, with different combinations of independent variables, are discussed for each practice.
Examination of individual landholder behaviours

In the following sections I provide explanations of relationships, including the nature of interactions between variables and COIC based on the literature, my analyses, experience in the field, and discussions with my supervisors. As will be explained below, the independent variable COIC made a unique and statistically significant contribution in all five behaviour models.

Land sown to perennial pasture and lucerne

Perennial pastures provide a number of benefits from reductions in salinity, wind and water erosion, as well as waterlogging\footnote{Waterlogging occurs as a result when “rainfall or irrigation exceeds the net water movement out of the soil profile, soil pores will become water-filled, displacing soil air” (Shaw et al., 2013, p. 550) and can occur from a rising water table or excess irrigation. Waterlogging reduces crop growth and yield by reducing the amount of oxygen concentrations around the roots, changing soil chemistry and reducing nutrients, and “changes in microbial activity affecting normal rhizosphere processes” (Shaw, et al., 2013, p. 550).} by controlling ground water (Bathgate & Pannell, 2002). Perennial pastures are generally deeper-rooted plants that are able to obtain water and nutrients from greater depths within the soil base. These deeper roots mean that this ground cover lasts longer as the plants are able to meet their moisture requirements for longer during periods with little rainfall and require less irrigation. Perennial pastures allow for greater production and less weeds. These benefits are a great appeal for landowners. With that said, perennial and annual pastures occupy different niches. The decision to replace annual pastures with perennial pastures is not guaranteed due to plant species response to rainfall and climatic conditions which may be ill-suited to a specific area (Kemp & Dowling, 1991). Perennial pastures are particularly appealing to the non-farmer and hobby farmer cohorts as this relatively permanent ground cover prevents erosion and an influx of weeds without the use of herbicides. These two types of landholders value the environmental aspects of their property and are concerned with keeping in harmony with nature (see Chapter 5).

Lucerne is the most broadly used plant species for animal fodder (hay or silage) production Australia wide with an expected stand life exceeding 3 years (Nichols et al., 2007). This perennial is suited for neutral to alkaline soil. The increased variety of
perennials (based on various rainfall and climate conditions) has increased farmer interest in the use of such legumes (Nichols, et al., 2007). The planting of perennial pasture and Lucerne requires a large initial investment and can take years to provide sufficient returns to break even. Landholders facing a large initial capital investment often need to see the financial benefits of engaging in a behaviour, in addition to increased productivity measures (Bennett & Cattle, 2014) in order to commit to the activity. Other factors relating to economic costs, difficulty of implementation, time scale and social issues also affect the adoption of recommended practices (Pannell, 2001). However, Lucerne can enhance long term productivity by providing a good quality summer feed and enabling greater stocking rates and animal condition (Bathgate & Pannell, 2002).

Perennial pastures require fertilizer for best yields. This requires that landowners have the equipment or resources to apply soil conditioners. Landholders will need the skill and equipment, which can be obtained through borrowing equipment or contracting the service out. However, Bennett and Cattle (2014) found that the perceived cost of using contractors and the lack of equipment were impediments to engaging in a behaviour. However, landholders may be able to overcome these barriers by relying on existing relationships to obtain such services. This is particularly relevant to members of Landcare groups who share knowledge, place a high value on certain land management practices and potentially provide access to the equipment necessary.

COIC scores for those who had not sown land to perennial pasture and Lucerne (Mean rank = 212.19) were significantly different from those who had sown perennial pasture and Lucerne (Mean rank = 380.83), U = 72324.50, z = 11.38, p < .001, r = .453. This is as expected; those with higher COIC scores (with a stronger farmer identification) are more likely to be motivated to implement practices that are expected to significantly increase fodder production and income per hectare. They are also more likely to have access to the equipment needed, and/or be connected or familiar with agricultural groups or contractors who could perform the service or provide technical advice and support; and have a greater knowledge of the practice itself. In this and the following practices, two tests were performed to assess the nature of the relationship between COIC and the engagement of a practice when different combinations of variables were utilised to assess the relationship.
Logistic regression was performed to assess the impact of factors included in the survey that were expected to contribute to respondents being more likely to report that they had sown perennial pasture and Lucerne. The inclusive model contained 14 independent variables, including values (i.e. productive value of soil, and obtaining a sense of accomplishment from building a viable business), concern about soil acidity, confidence in recommended practices related to perennial pasture and lucerne, a norm of feeling personally responsible to maintain the soils productive capacity, an information source (i.e. Victorian Farmers Federation), knowledge of soils, background information (e.g. has this enterprise bought additional land to increase a landholding in the past 20 years), and COIC [see Table 38]. The full model containing all predictors was statistically significant, $\chi^2(14, N = 532) = 236.707$, $p<.001$, indicating that the model was able to distinguish between respondents who reported and did not report land sown to perennial pasture and Lucerne. The model as a whole explained 48.8% (Nagelkerke R squared) of the variance in sowing status, and correctly classified 80.3% of cases.

As shown in Table 38, only three of the independent variables made a unique statistically significant contribution to the model: perennial pasture costs are justified by the returns (q4pp; an item measuring confidence in recommended practices), additional land purchased in the past 20 years (q11add), and irrigation used in 2013 (q11irr). The strongest predictor of reporting land sown to perennial pasture or Lucerne was the use of irrigation, recording an odds ratio of 2.25. This indicated that respondents who had used irrigation were over twice as likely to report sowing perennial pasture or lucerne than those who did not irrigate, controlling for all other factors in the model. COIC score did not make a statistically significant unique contribution to the variance explained. COIC may not have been statistically significant as there is a statistically significant relationship between COIC and the items identified in the GLM [Table 39]. That is, those items identified as significant may explain a large portion of the variance that COIC would also contribute to the explanatory power of the model. The three items of confidence in the recommended practice relating to costs of perennial pasture are justified by the returns, purchase of additional land and use of irrigation can be seen as proxy variables for a farmer identity (i.e. COIC score). Those individuals who are expanding their property, using irrigation and believe that
perennial pasture costs are justified by their returns are more likely to identify as farmers. Conversely, the non-farmers and hobby farmers would prefer the native grasses, which are largely adapted to the Australian soils and would require less fertilizer application creating a greater harmony with nature; congruent with lower COIC scores.
Table 38 Sown land to perennial pasture and lucerne inclusive model

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>COIC</td>
<td>COIC score</td>
<td>.029</td>
<td>.016</td>
<td>3.306</td>
<td>1</td>
<td>.069</td>
<td>1.029</td>
<td>.998</td>
<td>1.062</td>
</tr>
<tr>
<td>q2ph</td>
<td>Concern about issues: Soil acidity undermining productive capacity</td>
<td>.085</td>
<td>.083</td>
<td>1.046</td>
<td>1</td>
<td>.306</td>
<td>1.088</td>
<td>.925</td>
<td>1.280</td>
</tr>
<tr>
<td>q3soil</td>
<td>Value: Productive value of soil</td>
<td>.085</td>
<td>.145</td>
<td>.345</td>
<td>1</td>
<td>.557</td>
<td>1.089</td>
<td>.819</td>
<td>1.448</td>
</tr>
<tr>
<td>q3bus</td>
<td>Value: Sense of accomplishment from building a viable business</td>
<td>.031</td>
<td>.123</td>
<td>.064</td>
<td>1</td>
<td>.801</td>
<td>1.032</td>
<td>.811</td>
<td>1.313</td>
</tr>
<tr>
<td>q4ph</td>
<td>Confidence in RP: Costs of applying lime is justified</td>
<td>.166</td>
<td>.096</td>
<td>3.009</td>
<td>1</td>
<td>.083</td>
<td>1.180</td>
<td>.979</td>
<td>1.423</td>
</tr>
<tr>
<td>q4pp</td>
<td>Confidence in RP: Perennial pasture costs are justified by the returns</td>
<td>.527</td>
<td>.110</td>
<td>23.075</td>
<td>1</td>
<td>.000</td>
<td>1.694</td>
<td>1.366</td>
<td>2.100</td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.167</td>
<td>.143</td>
<td>1.376</td>
<td>1</td>
<td>.241</td>
<td>1.182</td>
<td>.894</td>
<td>1.563</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
<td>Coefficient</td>
<td>Standard Error</td>
<td>z-value</td>
<td>p-value</td>
<td>Beta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>---------</td>
<td>---------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q5vff</td>
<td>Information source: Victorian Farmers Federation</td>
<td>.294</td>
<td>.292</td>
<td>1.013</td>
<td>.314</td>
<td>1.342</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of soils</td>
<td>Knowledge of soils</td>
<td>.198</td>
<td>.187</td>
<td>1.112</td>
<td>.292</td>
<td>1.218</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q11add</td>
<td>Additional land purchased in past 20 years</td>
<td>.580</td>
<td>.273</td>
<td>4.520</td>
<td>.034</td>
<td>1.787</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q11fam</td>
<td>Family working full time on property</td>
<td>.432</td>
<td>.324</td>
<td>1.776</td>
<td>.183</td>
<td>1.540</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q11fd</td>
<td>Attend soil health program</td>
<td>.328</td>
<td>.256</td>
<td>1.646</td>
<td>.200</td>
<td>1.389</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q11irr</td>
<td>Irrigation used in 2013</td>
<td>.810</td>
<td>.277</td>
<td>8.542</td>
<td>.003</td>
<td>2.249</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q11tax</td>
<td>Property returned net profit</td>
<td>.324</td>
<td>.275</td>
<td>1.388</td>
<td>.239</td>
<td>1.383</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-5.861</td>
<td>.750</td>
<td>61.017</td>
<td>.000</td>
<td>.003</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Recommended practice (RP)
### Table 39 Significant independent variables identified in the GLM and the relationship with COIC

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Relationship with COIC (r_s)</th>
<th>P value</th>
<th>Sample size</th>
<th>Lower</th>
<th>Upper</th>
<th>95% C.I. for BCa\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4pp</td>
<td>0.273</td>
<td>0.000</td>
<td>716</td>
<td>0.197</td>
<td>0.343</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Mean Rank\textsuperscript{b}</th>
<th>P value</th>
<th>Z value</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11add</td>
<td>96,755.50</td>
<td>13.142</td>
<td>0.000</td>
<td>258.17</td>
<td>459.89</td>
</tr>
<tr>
<td>Q11irr</td>
<td>68,010.50</td>
<td>6.131</td>
<td>0.000</td>
<td>326.56</td>
<td>430.41</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Spearman correlation based on bootstrap results on 1000 samples.

\textsuperscript{b}Mann-Whitney U test

The second model, the restrictive model, contained 14 independent variables including values (e.g. productive value of soil, respecting the earth, great place to raise a family), an item addressing working on the property is a welcome break, the belief that pumping ground water can be done carefully without affecting the integrity of the aquifer, confidence in recommended practices (e.g. perennial pasture costs are justified by the returns), norms (e.g. responsibility to be in a soil health group), a risk assessment item (i.e. risks embraced as a challenge), and COIC [see Table 40]. The full model containing all predictors was statistically significant, \(\chi^2(14, N = 500) = 218.303, p<.001\), indicating that the model was able to distinguish between respondents who reported and did not report land sown to perennial pasture and Lucerne. The model as a whole explained 48.0% (Nagelkerke R squared) of the variance in sowing status, and correctly classified 80.2% of cases.

As shown in Table 40, four of the independent variables made a unique statistically significant contribution to the model: COIC score, working on the property is a welcome break from the normal occupation (q3occ; assigned value; negative relationship), sense of accomplishment from producing food and fibre (q3ff; assigned value), and perennial pasture costs are justified by the returns (q4pp; an item measuring confidence in recommended practices). The strongest predictor of reporting land sown to perennial pasture or Lucerne was the establishment costs.
being justified by the returns, recording an odds ratio of 1.78. This indicated that respondents who saw the returns justifying the establishment costs were almost twice as likely to report sowing perennial pasture or Lucerne than those who did not perceive the same benefit, controlling for all other factors in the model. The odds ratio of .82 for working on the property is a welcome break from the normal occupation was less than 1, indicating that for each increase in the Likert response of the property providing a welcome break, respondents were .82 times less likely to report having sown perennial pasture or Lucerne, controlling for other factors in the model.

In this model those who found working on their property to be a welcome break from their normal occupation were less likely to implement the practice of sowing perennial pasture and Lucerne. Those with a stronger business focus, confidence in the recommended practice that perennial pasture costs are justified by their returns, and higher COIC scores were more likely to sow perennial pasture and lucerne and also identify as farmers.
Table 40 Sown land to perennial pasture and lucerne restrictive model

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>COIC</td>
<td>COIC score</td>
<td>.043</td>
<td>.015</td>
<td>8.542</td>
<td>1</td>
<td>.003</td>
<td>1.043</td>
<td>1.014</td>
<td>1.074</td>
</tr>
<tr>
<td>q3occ</td>
<td>Working on the property is a welcome break</td>
<td>-.195</td>
<td>.082</td>
<td>5.731</td>
<td>1</td>
<td>.017</td>
<td>.823</td>
<td>.701</td>
<td>.965</td>
</tr>
<tr>
<td>q3fam</td>
<td>Value: Great place to raise a family</td>
<td>.048</td>
<td>.095</td>
<td>.260</td>
<td>1</td>
<td>.610</td>
<td>1.049</td>
<td>.872</td>
<td>1.263</td>
</tr>
<tr>
<td>q3veg</td>
<td>Value: Native vegetation provides habitat</td>
<td>-.246</td>
<td>.149</td>
<td>2.734</td>
<td>1</td>
<td>.098</td>
<td>.782</td>
<td>.584</td>
<td>1.047</td>
</tr>
<tr>
<td>q3soil</td>
<td>Value: Productive value of soil</td>
<td>.158</td>
<td>.158</td>
<td>1.007</td>
<td>1</td>
<td>.316</td>
<td>1.172</td>
<td>.860</td>
<td>1.596</td>
</tr>
</tbody>
</table>

Chi Square 218.303  
-2 Log likelihood 448.622  
Nagelkerke R Squared .480  
Correct Classification 80.2%
<table>
<thead>
<tr>
<th>q3nat</th>
<th>Value: Native</th>
<th>vegetation makes property attractive</th>
<th>.056</th>
<th>.131</th>
<th>.181</th>
<th>1</th>
<th>.670</th>
<th>1.058</th>
<th>.817</th>
<th>1.368</th>
</tr>
</thead>
<tbody>
<tr>
<td>q3res</td>
<td>Value: Respecting the earth</td>
<td>- .172</td>
<td>.133</td>
<td>1.672</td>
<td>1</td>
<td>.196</td>
<td>.842</td>
<td>.649</td>
<td>1.093</td>
<td></td>
</tr>
<tr>
<td>q3ff</td>
<td>Value: Sense of accomplishment from producing food and fibre</td>
<td>.260</td>
<td>.124</td>
<td>4.394</td>
<td>1</td>
<td>.036</td>
<td>1.297</td>
<td>1.017</td>
<td>1.654</td>
<td></td>
</tr>
<tr>
<td>q4aq</td>
<td>Belief: Pump ground water without affecting aquifer</td>
<td>.084</td>
<td>.088</td>
<td>.926</td>
<td>1</td>
<td>.336</td>
<td>1.088</td>
<td>.916</td>
<td>1.292</td>
<td></td>
</tr>
<tr>
<td>q4ph</td>
<td>Confidence in RP: Costs of applying lime is justified</td>
<td>.127</td>
<td>.099</td>
<td>1.649</td>
<td>1</td>
<td>.199</td>
<td>1.135</td>
<td>.936</td>
<td>1.377</td>
<td></td>
</tr>
<tr>
<td>q4pp</td>
<td>Confidence in RP: Perennial pasture costs are justified by the returns</td>
<td>.576</td>
<td>.111</td>
<td>26.849</td>
<td>1</td>
<td>.000</td>
<td>1.778</td>
<td>1.430</td>
<td>2.211</td>
<td></td>
</tr>
<tr>
<td>q4res</td>
<td>Norm: Responsibility to be in a soil health group</td>
<td>.154</td>
<td>.106</td>
<td>2.120</td>
<td>1</td>
<td>.145</td>
<td>1.166</td>
<td>.948</td>
<td>1.435</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>---</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.151</td>
<td>.155</td>
<td>.954</td>
<td>1</td>
<td>.329</td>
<td>1.163</td>
<td>.859</td>
<td>1.577</td>
<td></td>
</tr>
<tr>
<td>q8em</td>
<td>Risks embraced as a challenge</td>
<td>.058</td>
<td>.129</td>
<td>.201</td>
<td>1</td>
<td>.654</td>
<td>1.059</td>
<td>.823</td>
<td>1.363</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-4.822</td>
<td>.959</td>
<td>25.297</td>
<td>1</td>
<td>.000</td>
<td>.008</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Recommended practice (RP)
Environmental weeds can lead to the extinction of indigenous plant species threatening the stability and complexity of the ecosystem (Williams & West, 2000). The same could also be said for invasive animal species. Generally, landholders are left to their own volition to control pest plants and animals on their property. However, there are instances when a specific pest may have a significant impact on the environmental condition or agricultural production in which case government legislative intervention is necessary (Reeve et al., 2015). In a California, USA study, Rejmánek and Pitcairn (2002) concluded that weed infestations greater than 1000 ha are very difficult to eradicate resulting in a defensive strategy of ‘infinite financial commitment’ rather than an offensive strategy of eradication. The biodiversity and economic repercussions of an infestation of unwanted plants or animals are both motivators to control these invasive species including the pasture weeds fireweed, blackberry, and patterson’s curse. These weeds have the potential to ‘escape’ to high value areas impacting landholders from all cohorts.

Animals (e.g. deer, dogs, goats, rabbits) can be particularly invasive and destructive and are a nuisance for a number of other animals. For instance, holes in paddocks and the consumption of crops by pest animals is a concern. These nuisance animals also cause predation on native and domestic animals resulting in stress that may negatively affect the breeding cycle and resulting number off-spring. Pest animals can also introduce disease to livestock, spread weeds (i.e. blackberry) and can damage fences. Rabbits affect the establishment of new trees and can denude dry areas and cause erosion. Rabbit and wombat tunnels/burrows can cause erosion if left untreated resulting in hazards for both the landholder and livestock. However not all landholders are affected in the same way; graziers would be more affected than those who crop or who own land for lifestyle reasons (Reeve, et al., 2015).

COIC scores for those who had not spent time controlling pest animals and non-crop weeds (Mean rank = 178.24) were significantly different from those who had spent time controlling for pest animals and non-crop (including in pastures) weeds (Mean rank = 344.84), $U = 24261.50$, $z = 6.09$, $p < .001$, $r = .237$. This is as expected as those
with higher COIC scores (with a stronger farmer identification) are more likely to spend a greater amount of time working on the property and would have completed the practice either by itself or in combination with other practices (e.g. spraying weeds or setting traps/bait while checking fence lines). Additionally, those with a stronger farmer identity are generally more focused on productivity and allowing pest animals and non-crop weeds to go unchecked would reduce the productive capacity and economic benefit earned from their land.

Weeds have a large economic cost in the grazing industry and cropping industry. In the cropping industry, non-crop weeds reduce crop or pasture yields and cause product contamination. Some weeds may poison animals or lead to poor animal performance. The estimated costs of weeds in Australia exceed $3.5 billion per year (Pimentel, 2011). Serrated tussock (*Nassella trichotoma*), for instance, is a South American perennial grass that reduces livestock carrying capacity. Attempts to control this weed exceeded a cost of over $5 million in Victoria in 1997 alone (Pimentel, 2011). Non crop weeds and pest animals affect both agricultural and natural ecosystem biodiversity. As an example, blackberry is a prominent weed found in pastures, but is equally invasive in natural ecosystems (i.e. along waterways). Pest animals, like many weeds, cross boundaries of who they affect and they also impact the biodiversity of an area. That is, pest animals such as fox, wild dogs, and feral cats are major predators of native fauna. Cats, for instance, are tied to the extinction of larger species of native rodents (Abbott, 2002). The biosecurity risks associated with pest animals (e.g. foxes, wild dogs, deer) can harbour diseases that can be also transferred to stock (Pimentel et al., 2000) and cause problems such as spontaneous abortion in cattle. The combination of pest animals and non-crop weeds can be a costly and time intensive activity to control.

Logistic regression was performed to assess the impact of factors included in the survey that were expected to contribute to respondents being more likely to report that they had spent time controlling pest animals and non-crop weeds. The inclusive model contained four independent variables including the concern about the impact of pest plants and animals on native plants and animals, knowledge of soils, a prior behaviour including completion of a property management course, and COIC [see Table 41]. The full model containing all predictors was statistically significant, $\chi^2 (4, N = 611) = 76.296, p<.001$, indicating that the model was able to distinguish between
respondents who reported and did not report spending time controlling undesirable animals or weeds. The model as a whole explained 27.1% (Nagelkerke R squared) of the variance in time spent status, and correctly classified 92.5% of cases.

As shown in Table 41, three of the independent variables made a unique statistically significant positive contribution to the model: concern about the impact of pest plants and animals on native plants and animals (q<sub>2pp</sub>), knowledge of soils and COIC score (as hypothesised). The strongest predictor of reporting spending time controlling unwanted animals or weeds was having completed a short course relevant to property management (e.g. financial planning, integrated pest management) in the past 5 years, recording an odds ratio of 3.43. This indicated that respondents who had completed such courses were over three times as likely to report controlling unwanted species than those who had not completed a similar course, controlling for all other factors in the model. Individuals completing such courses would likely understand the impact of letting non crop weeds and pest animals go unabated. As explained in the previous model, those with a stronger farmer identification would be more likely to be concerned and cognizant of factors that would reduce productivity and profitability. Those with higher COIC scores would be more proactive and vigilant in combating factors that jeopardises their productive capacity and are more likely to identify as farmers. In addition, social norms of what it means to be a ‘good farmer’ may influence the control of pest animals and non-crop weeds. Farmers take pride in having no weeds on their property (Burton, 2004b) and do not want to be seen in a negative light. Similarly, graziers also control non crop weeds in areas within and outside the pasture boundaries which protects against weed infestation in the pastures.

Non-farmers lack knowledge, time, money, and assign a lower priority to participate in this behaviour. However, collective action is often necessary to combat the community issue of pest plants and non-crop weeds. For example, the collective community needs to participate in rabbit poisoning and / or disturbing rabbit burrows. Addressing pest animals singularly does not isolate or contain the problem. If one landholder does not subscribe to the control of such pest plants and animals, the pests will have a location to regenerate and repopulate neighbouring property boundaries; thus the efforts of neighbouring landholders will be for naught. The community as a whole must address
an issue for a problem to be controlled/eradicated. The first step could be providing additional short courses relevant to property management (e.g. integrated pest management) as individuals who completed such a course are over three times as likely to spend time controlling such pests.
## Table 41 Time spent controlling pest animals and non-crop weeds inclusive model

<table>
<thead>
<tr>
<th>N</th>
<th>611</th>
<th>P value</th>
<th>&lt; .001</th>
<th>Nagelkerke R Squared</th>
<th>.271</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi Square</td>
<td>76.296</td>
<td>-2 Log likelihood</td>
<td>269.803</td>
<td>Correct Classification</td>
<td>92.5%</td>
</tr>
</tbody>
</table>

### Variables in the Equation

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>q2pp</td>
<td>Concern about issues: Impact of pest plants and animals on native plants and animals</td>
<td>.295</td>
<td>.118</td>
<td>6.322</td>
<td>1</td>
<td>.012</td>
<td>1.344</td>
<td>1.067</td>
<td>1.692</td>
</tr>
<tr>
<td>q11in</td>
<td>Completed property management course</td>
<td>1.231</td>
<td>.752</td>
<td>2.677</td>
<td>1</td>
<td>.102</td>
<td>3.425</td>
<td>.784</td>
<td>14.969</td>
</tr>
<tr>
<td>COIC score</td>
<td>COIC score</td>
<td>.040</td>
<td>.015</td>
<td>7.144</td>
<td>1</td>
<td>.008</td>
<td>1.041</td>
<td>1.011</td>
<td>1.072</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-2.102</td>
<td>.652</td>
<td>10.400</td>
<td>1</td>
<td>.001</td>
<td>.122</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The second test, the restrictive model, contained four independent variables including the confidence in recommended practice related to perennial pasture costs being justified by the returns and intensive grazing (i.e. intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking), the norm of responsibility to maintain productive capacity, and COIC [see Table 42]. The full model containing all predictors was statistically significant, $\chi^2 (4, N = 623) = 64.104, p<.001$, indicating that the model was able to distinguish between respondents who reported and did not report spending time controlling pest plants and animals. The model as a whole explained 23.3% (Nagelkerke R squared) of the variance, and correctly classified 92.6% of cases.

As shown in Table 42, two of the independent variables made a unique statistically significant contribution to the model: COIC score and perennial pasture costs are justified by the returns (q4pp; an item measuring confidence in a recommended practice). The strongest predictor of reporting controlling nuisance weeds or animals was the establishment costs of perennial pasture being justified by the returns, recording an odds ratio of 1.28. This indicated that respondents who saw the returns justifying the establishment costs were almost one and a half times as likely to report controlling for weeds or animals than those who did not perceive that the returns outweighed the establishment costs, controlling for all other factors in the model. As in the inclusive model, COIC and perennial pasture costs both appear as statistically significant items in the model. It seems that individuals who identify more strongly as farmers are more likely to see the cost and effort of controlling non-crop weeds as an important business decision.
Table 42 Time spent controlling pest animals and non-crop weeds restrictive model

<table>
<thead>
<tr>
<th>N</th>
<th>623</th>
<th>P value</th>
<th>.000</th>
<th>Nagelkerke R Squared</th>
<th>.233</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi Square</td>
<td>64.104</td>
<td>-2 Log likelihood</td>
<td>274.180</td>
<td>Correct Classification</td>
<td>92.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COIC</td>
<td>COIC score</td>
<td>.054</td>
<td>.012</td>
<td>18.943</td>
<td>1</td>
<td>.000</td>
<td>1.055</td>
<td>1.030 to 1.081</td>
</tr>
<tr>
<td>q4pp</td>
<td>Confidence in RP: Perennial pasture costs are justified by the returns</td>
<td>.248</td>
<td>.108</td>
<td>5.245</td>
<td>1</td>
<td>.022</td>
<td>1.282</td>
<td>1.036 to 1.585</td>
</tr>
<tr>
<td>q4set</td>
<td>Confidence in RP: Short periods of intensive grazing</td>
<td>.139</td>
<td>.101</td>
<td>1.878</td>
<td>1</td>
<td>.171</td>
<td>1.149</td>
<td>.942 to 1.401</td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.136</td>
<td>.124</td>
<td>1.197</td>
<td>1</td>
<td>.274</td>
<td>1.146</td>
<td>.898 to 1.462</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-.962</td>
<td>.462</td>
<td>4.335</td>
<td>1</td>
<td>.037</td>
<td>.382</td>
<td></td>
</tr>
</tbody>
</table>

Note: Recommended practice (RP)
**Tested soils for nutrient status where fertiliser/soil conditioners were applied**

An improper balance of nutrients is a major constraint on production, but one that is correctable. For example, when phosphorus levels are low super phosphate can be applied to correct the imbalance. However, the amount of fertilizer applied is largely dependent on the economic resources of the landholder and on the level of improvement it creates. If too little is applied then a difference in production is not observed; applying too much may result in surface or groundwater run-off.

Phosphorus, however, has the power to fix soil imbalances just as clover and soybeans (lentils) fix nitrogen. Therefore, farmers, who are interested in pushing production, are more likely to adopt this practice. Farmers do not want to waste resources, and as they generally have more knowledge of soil testing and are generally more aware of the indicators of improper nutrient balances, would be more likely to engage in testing soils for nutrient status.

COIC scores for those who did not test soils for nutrient status where fertiliser / soil conditioners were applied (Mean rank = 213.93) were significantly different from those who did test soils nutrient status (Mean rank = 369.14), U = 67699.50, z = 10.42, p < .001, r = .418. This is as expected as those with higher COIC scores (with a stronger farmer identification) are more likely to have access to the equipment, and be connected or familiar with agricultural groups or contractors who could perform the service. These individuals also have a greater knowledge of the practice itself and are concerned about the soil nutrient status and resulting impact on the productivity levels of their soils, and in turn, farm production and profits.

Logistic regression was performed to assess the impact of factors included in the survey that were expected to contribute to respondents being more likely to report that they had tested for nutrient status where fertiliser/soil conditioners were applied. The inclusive model contained 10 independent variables including values (e.g. sense of accomplishment from producing food and fibre), the concern that returns limit investment, information sources (i.e. Victorian Farmers Federation, and agricultural consultants), knowledge of soils, background information (e.g. is a member or involved with a local soil health group, attended field days/farm walks/demonstrations focused on soil health in the past 12 months), and COIC [see Table 43]. The full model
containing all predictors was statistically significant, $\chi^2 (10, N = 529) = 230.059, p<.001$, indicating that the model was able to distinguish between respondents who reported and did not report testing soils for nutrient status. The model as a whole explained 47.9% (Nagelkerke R squared) of the variance in testing status, and correctly classified 79.0% of cases.

As shown in Table 43, three of the independent variables made a unique statistically significant contribution to the model: sense of accomplishment from producing food and fibre for others (q3ff; assigned value), knowledge of soils, and attendance of field days/farm walks/demonstrations focused on soil health in the past 12 months (q11fd). The strongest predictor of reporting testing soil for nutrient status was involvement with local soil health group, recording an odds ratio of 3.12. This indicated that respondents who were involved with a local soil health group were over three times as likely to report testing soil nutrient status than those who were not involved, controlling for all other factors in the model. The second strongest predictor of reporting testing soil for nutrient status was knowledge of soils, recording an odds ratio of 2.88. This indicated that respondents who had a higher knowledge of soils were almost three times as likely to report testing soil nutrient status than those who had lower levels of knowledge, controlling for all other factors in the model. COIC score did not contribute a statistically significant unique contribution to the variance.

COIC may not have been indicated as there is a statistically significant relationship between COIC and the items identified in the GLM [Table 44]. That is, those items identified as significant may explain a large portion of the variance that COIC would also contribute to the explanatory power of the model. The three items (i.e. sense of accomplishment from producing food and fibre for others, knowledge of soils, and attendance of field days/farm walks/demonstrations focused on soil health) can be seen as proxy variables for a farmer identity. However, as observed in the beginning paragraph of this section, COIC scores were statistically significant between those who did and did not implement the practice.

Those individuals with a higher COIC score are also more interested in food and fibre production, have a greater knowledge of soils, and attend programs focused on soil health. Full-time and part-time farmers are more likely to be part of platforms (e.g.
Landcare) where property management planning occurs and is promoted. A similar finding existed between two types of landholders (e.g. farmers / non-farmers) in the Wimmera Catchment (adjacent to my study site) in that a greater percentage of farmers were members of Landcare. In the Wimmera 44% of farmers had prepared a property management plan compared to 25% of non-farmers (Curtis & Mendham, 2012). In this research those reporting having prepared or are preparing a property management / whole farm plan were predominately full-time farmers (60.6%) and part-time farmers (30.3%) (utilising the typology created using the COIC). Combined, non-farmers and hobby farmers made up 9.1% of all respondents reporting having prepared or are preparing a whole property management / farm plan. This similarity between the two catchments is expected as land management planning occurs at the state level and implementation is similar across all catchments.
Table 43 Tested soils for nutrient status where fertiliser/soil conditioners were applied inclusive model

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>q2low</td>
<td>Concern about issues: Returns limit investment</td>
<td>.103</td>
<td>.086</td>
<td>1.416</td>
<td>1</td>
<td>.234</td>
<td>1.108</td>
<td>.936 1.312</td>
</tr>
<tr>
<td>q3ff</td>
<td>Value: Sense of accomplishment from producing food and fibre</td>
<td>.302</td>
<td>.116</td>
<td>6.742</td>
<td>1</td>
<td>.009</td>
<td>1.353</td>
<td>1.077 1.700</td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.268</td>
<td>.151</td>
<td>3.163</td>
<td>1</td>
<td>.075</td>
<td>1.307</td>
<td>.973 1.757</td>
</tr>
<tr>
<td>q5vff</td>
<td>Information source: Victorian Farmers Federation</td>
<td>.289</td>
<td>.282</td>
<td>1.052</td>
<td>1</td>
<td>.305</td>
<td>1.335</td>
<td>.769 2.318</td>
</tr>
<tr>
<td>q5ag</td>
<td>Information source: Agricultural consultants</td>
<td>.411</td>
<td>.300</td>
<td>1.877</td>
<td>1</td>
<td>.171</td>
<td>1.509</td>
<td>.838 2.719</td>
</tr>
<tr>
<td>COIC score</td>
<td>COIC score</td>
<td>.001</td>
<td>.016</td>
<td>.003</td>
<td>1</td>
<td>.957</td>
<td>1.001</td>
<td>.970 1.032</td>
</tr>
</tbody>
</table>

Chi Square 230.059, -2 Log likelihood 474.428, Correct Classification 79.0%
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Relationship with COIC ($r_s$)</th>
<th>P value</th>
<th>Sample size</th>
<th>95% C.I. for BCa a</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of soils</td>
<td>.620</td>
<td>.000</td>
<td>732</td>
<td>.567</td>
<td>.567</td>
<td>.671</td>
</tr>
<tr>
<td>Q3ff</td>
<td>.593</td>
<td>.000</td>
<td>721</td>
<td>.539</td>
<td>.539</td>
<td>.642</td>
</tr>
</tbody>
</table>

**Mean Rank b**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>U</th>
<th>z</th>
<th>P value</th>
<th>r</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q11fd</td>
<td>83.636</td>
<td>9.513</td>
<td>.000</td>
<td>.366</td>
<td>294.85</td>
<td>444.62</td>
</tr>
</tbody>
</table>

---

**Table 44 Significant independent variables identified in the GLM and the relationship with COIC**

a. Spearman correlation based on bootstrap results on 1000 samples.
b. Mann-Whitney U test
The restrictive model contained 11 independent variables, including values (e.g. productive value of soil, working for the welfare of others), confidence in recommended practices (e.g. costs of applying lime are justified by the returns), beliefs (e.g. if we are careful it is possible to pump ground water without affecting the integrity (water quality and level) of the aquifer), norms (e.g. responsibility to maintain productive capacity), and a risk assessment item (i.e. I usually view risks as a challenge to embrace) [see Table 45]. The full model containing all predictors was statistically significant, $\chi^2 (11, N = 491) = 159.664, p<.001$, indicating that the model was able to distinguish between respondents who reported and did not report testing soils for nutrient status. The model as a whole explained 37.6% (Nagelkerke R squared) of the variance in testing status, and correctly classified 74.9% of cases.

As shown in Table 45, three of the independent variables made a unique statistically significant contribution to the model: COIC score, a place where I can escape the pressures of life (q3esc; assigned value; negative relationship), and obtaining a sense of accomplishment from producing food and fibre (q3ff; assigned value). The strongest predictor of reporting testing soil for nutrient status was the respondents’ assigned value of obtaining a sense of accomplishment from producing food and fibre, recording an odds ratio of 1.35. This indicated that respondents who had stronger values regarding producing an agricultural product were almost one and a half times as likely to report testing soil nutrient status then those who reported weaker values obtaining a sense of accomplishment from producing food and fibre, controlling for all other factors in the model. This is as expected as farmers generally place a higher value on producing food and fibre.

Testing soil nutrient status is an important part in ensuring the productivity and viability of their agricultural operation. The odds ratio of .64 for the item of property providing a place to escape the pressures of life was less than 1, indicating that for each increase in the Likert response of the element of escape, respondents were .64 times less likely to report testing soil nutrient status where fertiliser/soil conditioners were applied in the past, controlling for other factors in the model. This is not surprising as respondents who found that working on their property led to a form of escapism likely held outside employment, had lower COIC scores and a lower farmer identity. Those who worked on the property full–time likely did not view working on
their property as an escape as it is part of their normal everyday lives. The independent variables of producing food and fibre (positive relationship) and the negative relationship of the property offers a place to escape align with a stronger farmer identity (and higher COIC score).
Table 45: Tested soils for nutrient status where fertiliser/soil conditioners were applied restrictive model

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>COIC</td>
<td>COIC score</td>
<td>.048</td>
<td>.014</td>
<td>11.881</td>
<td>1</td>
<td>.001</td>
<td>1.049</td>
<td>1.021</td>
<td>1.079</td>
</tr>
<tr>
<td>q3new</td>
<td>Value: Opportunity to learn</td>
<td>.192</td>
<td>.112</td>
<td>2.946</td>
<td>1</td>
<td>.086</td>
<td>1.212</td>
<td>.973</td>
<td>1.509</td>
</tr>
<tr>
<td>q3occ</td>
<td>Value: Property work is a welcome break</td>
<td>-.057</td>
<td>.090</td>
<td>.408</td>
<td>1</td>
<td>.523</td>
<td>.944</td>
<td>.792</td>
<td>1.126</td>
</tr>
<tr>
<td>q3esc</td>
<td>Value: A place to escape</td>
<td>-.441</td>
<td>.107</td>
<td>17.093</td>
<td>1</td>
<td>.000</td>
<td>.643</td>
<td>.522</td>
<td>.793</td>
</tr>
<tr>
<td>q3ff</td>
<td>Value: Sense of accomplishment from producing food and fibre</td>
<td>.296</td>
<td>.124</td>
<td>5.737</td>
<td>1</td>
<td>.017</td>
<td>1.345</td>
<td>1.055</td>
<td>1.713</td>
</tr>
<tr>
<td>q3soil</td>
<td>Value: Productive value of soil</td>
<td>.078</td>
<td>.150</td>
<td>.273</td>
<td>1</td>
<td>.602</td>
<td>1.082</td>
<td>.806</td>
<td>1.452</td>
</tr>
<tr>
<td>q3wel</td>
<td>Value: Welfare of others</td>
<td>.174</td>
<td>.122</td>
<td>2.043</td>
<td>1</td>
<td>.153</td>
<td>1.190</td>
<td>.938</td>
<td>1.510</td>
</tr>
<tr>
<td>q4aq</td>
<td>Belief: Pump ground water without affecting aquifer</td>
<td>.053</td>
<td>.084</td>
<td>.402</td>
<td>1</td>
<td>.526</td>
<td>1.054</td>
<td>.895</td>
<td>1.242</td>
</tr>
<tr>
<td>q4ph</td>
<td>Confidence in RP: Costs of applying lime is justified</td>
<td>.108</td>
<td>.087</td>
<td>1.549</td>
<td>1</td>
<td>.213</td>
<td>1.114</td>
<td>.940</td>
<td>1.321</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------</td>
<td>------</td>
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<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.285</td>
<td>.150</td>
<td>3.606</td>
<td>1</td>
<td>.058</td>
<td>1.330</td>
<td>.991</td>
<td>1.786</td>
</tr>
<tr>
<td>q8em</td>
<td>Risks embraced as a challenge</td>
<td>.182</td>
<td>.123</td>
<td>2.200</td>
<td>1</td>
<td>.138</td>
<td>1.200</td>
<td>.943</td>
<td>1.526</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-4.901</td>
<td>.900</td>
<td>29.686</td>
<td>1</td>
<td>.000</td>
<td>.007</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Recommended practice (RP)
Area with at least one lime application over the full period of management

Australian soils are naturally washed (i.e. acidic) and infertile. Lime is a soil conditioner that adjusts the pH of the soil making it less acidic, and influences soil productive capacity if applied at the correct rate. Landholders are generally able to correctly identify areas of concern on their property as evidenced in Curtis et al. (2000) in which most landholders in the Goulburn catchment area were able to correctly identify salinity problems on their property. Outside of the use of lime, perennial pastures with a strong clover base also fix nitrogen and de-acidifies the soil; the removal of such plant material will increase soil acidity. Lime, however is the accepted practice for addressing soil pH problems. In general, one ton to the acre is applied every 10 years. Land uses including cropping and the dairy industry will require more frequent application of lime, and doubling production is entirely possible with such application. Lime improves soil health and decreases the frequency of bare ground exposure. Fewer bare spots also means that there are less opportunities for weeds to take hold which in turn means that less herbicides are required. Not every area requires a soil conditioner. Native pastures are one such cover crop that do not require lime application as the plants are adapted to the soil conditions. The land use, along with the landholder’s views, dictate the engagement of lime application.

Research has indicated that non-farmers know little about soil acidity in general, yet this cohort can identify salinity problems on their property (Curtis, et al., 2000). The expectation is that farmers who obtain income from agriculture have a greater knowledge base about farming practices, have networks that provide educational material and other resources, and are more apt to conduct this practice. Individuals who are involved with intensive cropping and are more reliant upon production resulting in income are more likely to implement this practice. However, as Bennett and Cattle (2014) found, “those with larger properties are more inclined to view the resulting soil changes due to lime...as producing uncertain or low returns” (p. 125) indicating that property size affects the landholder judgement of lime application – a smaller area results in less risk.

COIC scores for those who had not applied at least one lime application (Mean rank = 256.62) were significantly different from those who had applied lime (Mean rank =
higher COIC scores (with a stronger farmer identification) are more likely to be motivated by the goal of having a viable farm business (liming is considered critical to addressing soil acidity), have access to the equipment, be connected or familiar with agricultural groups or contractors who could perform the service. Additionally those with higher COIC scores would likely have a greater knowledge of the rationale for why lime was needed and in the practice of lime application itself. The recommended practice in dryland grazing systems, based on introduced perennial pasture, is lime application to manage soil acidity (a key factor limiting fodder production in south east Australia) about every 10 years at a rate of 1.5 to 5 tonnes per hectare dependent on soil type (Corangamite Catchment Management Authority, 2003). Without lime, the soil becomes too acidic and certain preferred agricultural plant species (i.e. phalaris and lucerne) are unable to grow.

Logistic regression was performed to assess the impact of factors included in the survey that were expected to contribute to respondents being more likely to report that they had applied lime at some point over the course of their management. The inclusive model contained eight independent variables, including values (i.e. obtaining a sense of accomplishment from producing food and fibre), concerns about the property (i.e. soil acidity undermining productive capacity), confidence in recommended practices (i.e. cost of lime application is justified by the returns), a norm of responsibility to maintain the soils’ productive capacity, knowledge of soils, background information (i.e. attended field days/farm walks/ demonstrations focused on soil health in the past 12 months, and is a member or involved with a local Landcare group), and COIC [see Table 46]. The full model containing all predictors was statistically significant, \( \chi^2 (8, N = 544) = 181.385 \), \( p < .001 \), indicating that the model was able to distinguish between respondents who reported and did not report lime application. The model as a whole explained 37.9% (Nagelkerke R squared) of the variance in testing status, and correctly classified 74.4% of cases.

As shown in Table 46, three of the independent variables made a unique statistically significant contribution to the model: concern about soil acidity (lower pH) undermining productive capacity of soils (q2ph), the belief that the costs of applying lime to address soil acidity are justified by increased production (q4ph; an item
measuring confidence in recommended practices), and knowledge of soils. The strongest predictor of reporting lime application was knowledge of soils, recording an odds ratio of 1.89. This indicated that respondents who had more knowledge of soils were almost twice as likely to report lime application then those who had less knowledge, controlling for all other factors in the model.

Contrary to the expectation, COIC score did not contribute a statistically significant unique contribution to the variance. COIC may not have been identified due to the statistically significant relationship between COIC and the items identified in the GLM [Table 47]. That is, those items identified as significant may explain a large portion of the variance that COIC would also contribute to the explanatory power of the model. Knowledge of soils has a significant, and strong, correlation with COIC. The inclusion of one may omit the other item from producing a statistically significant unique contribution. The three items of concern of soil acidity undermining the productive capacity of soils, the confidence in recommended practice item that lime costs are justified by the returns, and knowledge of soils can be seen as proxy variables for a farmer identity (i.e. COIC score). However, as observed in the beginning paragraph of this section, COIC scores were statistically significant between those who did and did not implement the practice. Individuals who are knowledgeable and focused on the health of the soil are more likely to identify as farmers (and have higher COIC scores).
Table 46 Area with at least one lime application inclusive model

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>P value</th>
<th>Nagelkerke R Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>544</td>
<td>&lt; .001</td>
<td>.379</td>
</tr>
<tr>
<td>Chi Square</td>
<td>181.385</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2 Log likelihood</td>
<td>569.196</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct Classification</td>
<td>74.4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>q2ph</td>
<td>Concern about issues: Soil acidity undermining productive capacity</td>
<td>.205</td>
<td>.075</td>
<td>7.389</td>
<td>1</td>
<td>.007</td>
<td>1.227</td>
<td>1.059</td>
<td>1.423</td>
</tr>
<tr>
<td>q3ff</td>
<td>Value: Sense of accomplishment from producing food and fibre</td>
<td>.053</td>
<td>.111</td>
<td>.234</td>
<td>1</td>
<td>.628</td>
<td>1.055</td>
<td>.849</td>
<td>1.310</td>
</tr>
<tr>
<td>q4ph</td>
<td>Confidence in RP: Costs of applying lime is justified</td>
<td>.576</td>
<td>.098</td>
<td>34.606</td>
<td>1</td>
<td>.000</td>
<td>1.779</td>
<td>1.468</td>
<td>2.155</td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.147</td>
<td>.130</td>
<td>1.280</td>
<td>1</td>
<td>.258</td>
<td>1.159</td>
<td>.898</td>
<td>1.495</td>
</tr>
<tr>
<td></td>
<td>Knowledge of soils</td>
<td>.635</td>
<td>.171</td>
<td>13.727</td>
<td>1</td>
<td>.000</td>
<td>1.887</td>
<td>1.349</td>
<td>2.640</td>
</tr>
<tr>
<td>q11fd</td>
<td>Attend soil health program</td>
<td>.394</td>
<td>.221</td>
<td>3.180</td>
<td>1</td>
<td>.075</td>
<td>1.482</td>
<td>.962</td>
<td>2.284</td>
</tr>
<tr>
<td>q11lc</td>
<td>Involved with Landcare group</td>
<td>.349</td>
<td>.218</td>
<td>2.575</td>
<td>1</td>
<td>.109</td>
<td>1.418</td>
<td>.926</td>
<td>2.173</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>Relationship with COIC ($r_s$)</td>
<td>P value</td>
<td>Sample size</td>
<td>95% C.I. for BCa$^a$ Lower</td>
<td>95% C.I. for BCa$^a$ Upper</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
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<td>---------</td>
<td>-------------</td>
<td>----------------------------</td>
<td>--------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2ph</td>
<td>.180</td>
<td>.000</td>
<td>723</td>
<td>-.003</td>
<td>.253</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4ph</td>
<td>.306</td>
<td>.000</td>
<td>722</td>
<td>.237</td>
<td>.376</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of soils</td>
<td>.620</td>
<td>.000</td>
<td>732</td>
<td>.567</td>
<td>.671</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Recommended practice (RP)

a. Spearman correlation based on bootstrap results on 1000 samples.
The restrictive model contained seven independent variables, including values (e.g. productive value of soils, obtaining a sense of accomplishment from producing food and fibre), confidence in recommended practices (i.e. soil testing is an essential first step in understanding soil condition, and the costs of applying lime to address soil acidity are justified by increased production), a norm (i.e. feeling a personal responsibility to maintain productive capacity of soil), and COIC [see Table 48]. The full model containing all predictors was statistically significant, $\chi^2 (7, N = 518) = 147.518, p<.001$, indicating that the model was able to distinguish between respondents who reported and did not report applying lime at some point during their period of land management. The model as a whole explained 33.1% (Nagelkerke R squared) of the variance in testing status, and correctly classified 72.4% of cases.

As shown in Table 48, four of the independent variables made a unique statistically significant contribution to the model: COIC, working on the property is a welcome break from my normal occupation (q3occ; assigned value; negative relationship), the belief that the costs of applying lime to address soil acidity are justified by increased production (q4ph; an item measuring confidence in recommended practices), and feeling a personal responsibility to maintain the soil’s productive capacity (q4cap; personal norm). The strongest predictor of reporting lime application was the confidence in recommended practices variable measuring the costs of applying lime to address soil acidity are justified by increased production, recording an odds ratio of 1.85. This indicated that respondents who had stronger views that lime application costs were justified by increased production were almost twice as likely to report applying lime then those who reported weaker views, controlling for all other factors in the model.

The odds ratio of .84 for the item of property work is a welcome break from the normal occupation was less than 1, indicating that for each increase in the Likert response of the element of a form of escape, respondents were .84 times less likely to report testing soil nutrient status where fertiliser/soil conditioners were applied in the past, controlling for other factors in the model. This is not surprising as respondents who found that working on their property was a welcome break likely held outside employment, had lower COIC scores and a lower farmer identity. Those who worked on the property full-time likely did not view working on their property as a break from
their normal occupation as it is part of their normal everyday lives. The independent variables of costs of applying lime are justified by the returns, feeling a personal responsibility to maintain the soil’s productive capacity (positive relationships), and the negative relationship of the property is a welcome break from the normal occupation align with a stronger farmer identity (and higher COIC score).
Table 48 Area with at least one lime application restrictive model

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Variables in the Equation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COIC score</td>
<td>COIC score</td>
<td>.026</td>
<td>.012</td>
<td>4.428</td>
<td>1</td>
<td>.035</td>
<td>1.026</td>
<td>1.002 – 1.051</td>
</tr>
<tr>
<td>q3occ</td>
<td>Value: Property work is a welcome break</td>
<td>-.177</td>
<td>.069</td>
<td>6.617</td>
<td>1</td>
<td>.010</td>
<td>.838</td>
<td>.732 – .959</td>
</tr>
<tr>
<td>q3ff</td>
<td>Value: Sense of accomplishment from producing food and fibre</td>
<td>.186</td>
<td>.115</td>
<td>2.633</td>
<td>1</td>
<td>.105</td>
<td>1.204</td>
<td>.962 – 1.507</td>
</tr>
<tr>
<td>q3soil</td>
<td>Value: Productive value of soil</td>
<td>.009</td>
<td>.136</td>
<td>.004</td>
<td>1</td>
<td>.950</td>
<td>1.009</td>
<td>.772 – 1.317</td>
</tr>
<tr>
<td>q4soil</td>
<td>Confidence in RP: Soil testing</td>
<td>.036</td>
<td>.117</td>
<td>.097</td>
<td>1</td>
<td>.756</td>
<td>1.037</td>
<td>.825 – 1.304</td>
</tr>
<tr>
<td>q4ph</td>
<td>Confidence in RP: Costs of applying lime is justified</td>
<td>.616</td>
<td>.100</td>
<td>38.043</td>
<td>1</td>
<td>.000</td>
<td>1.851</td>
<td>1.522 – 2.251</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th>518</th>
<th>P</th>
<th>&lt; .001</th>
<th>Nagelkerke R Squared</th>
<th>.331</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi Square</td>
<td>147.518</td>
<td>-2 Log likelihood</td>
<td>565.749</td>
<td>Correct Classification</td>
<td>72.4%</td>
</tr>
<tr>
<td>q4cap</td>
<td>Norm: Responsibility to maintain productive capacity</td>
<td>.315</td>
<td>.142</td>
<td>4.902</td>
<td>1</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>---</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-5.006</td>
<td>.773</td>
<td>41.957</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Recommended practice (RP)
Fencing to manage stock access is important as the presence of stock contributes to land degradation. The impact and concentration of force from hooved animals, and the non-selective nature of their grazing (e.g. cows), are reasons why a landholder would fence native areas. There is evidence that the compaction around trees affects new tree growth as evidenced in the work by Spooner et al. (2002). The area around native trees also has a higher concentration of nutrients from animals who congregate at the bottom and defecate increasing the nutrients and reducing the amount of water that is able to reach the root system. Animals also impact trees when they strip the bark resulting in the tree becoming stunted or dying.

Fencing property requires effort, but results in benefits that both farmers and non-farmers can enjoy. Fencing land increases the chances of establishment of native perennial grasses, reduces the instance of exotic annual species, and creates less prevalence for soil compaction while increasing tree recruitment (Spooner, et al., 2002). Non-farmers have a stronger interest in biodiversity values and a greater overall concern than full-time farmers as evidenced in this research (see Chapter 5). Non-farmers would be particularly interested in fencing livestock to control the movement of livestock as “frequent high density grazing, particularly when associated with clearing, cultivation and fertiliser addition, was associated with the persistence of very few native plant species” (Dorrough et al., 2006, p. 394).

Ticehurst et al. (2011) found that financial and production related factors influenced the fencing of bushland to a higher degree than conservation related reasons. Curtis, et al. (2000) found a significant negative relationship between a farmer occupation and the adoption of fencing areas of remaining native bush and waterways to manage stock access, indicating that farmers who are reliant upon on-property income are reluctant to cede land to conservation efforts. With that said, full-time farmers are more likely to be involved in landcare groups, have stronger farmer networks, resources and funding opportunities available, or can find organized groups to do the work through either self-motivation or peer pressure. Non-farmers generally would not be as actively involved or succumb to the same peer pressure as those more
involved in the community and who may feel an obligation to live up to the definition of a ‘good farmer’ (Burton, 2004b).

Despite the trend for a negative relationship between COIC scores and fencing land to manage stock access to native bush/grasslands, there was not a significant difference in COIC scores for those who had (Mean rank = 58.07) and had not [(Mean rank = 96.93), U = 902.50, z = 1.84, p < .066, r = .133] fenced land to manage stock access to native bush/grassland. This is contrary to what was expected. It was expected that those with higher COIC scores (and with a stronger farmer identification) would fence less native bush/grassland as they would want to utilise every part of their property to achieve the maximum possible production. It was also expected that those with lower farmer identities (and lower COIC scores) who were not as dependent on production from their property as a source of income, would have been more likely to fence native bush/grassland to manage stock access. However, this finding is not entirely surprising as evidenced in the Wimmera Catchment (adjacent to the North Central Catchment) where farmers and non-farmers did not differ statistically implementing fencing native bush/grasslands to manage stock access (Curtis & Mendham, 2012).

Standard multiple regression was used to assess the ability of a number of factors to predict area of native bush and/or grassland fenced to manage stock access. Analysis was limited to those individuals who reported owning dairy cattle, beef cattle, sheep or other commercial livestock (n=493). The inclusive model contained seven independent variables, including values (e.g. obtaining a sense of accomplishment from building a viable business, and protecting the environment and preserving nature), knowledge (e.g. related to property planning, soil erosion minimization, and of soils), background information (e.g. have prepared or are preparing a property management or whole farm plan), and COIC [see Table 49]. The full model containing all predictors was statistically significant, F (7, 173) = 4.99, p<.001, explaining 17.5% of the total variance of area fenced to manage stock access.

As shown in Table 49, one of the independent variables made a statistically significant unique contribution to the model: COIC score (negative relationship). The COIC score uniquely explained 2.3% of the variance in the model. That is, 2.3% of the total
variance in the dependent variable is uniquely explained by the COIC score, and removing this item would result in a decrease of 2% in the total variance explained. The COIC score had the strongest correlation \((r = -0.36)\) with proportion of area of native bush / grassland fenced to manage stock access of all the independent variables, while the guiding principle of protecting the environment and preserving nature was the weakest [Table 50]. This negative relationship between fencing native bush / grassland and COIC indicates that those who have lower COIC scores and are more likely to identify as non-farmers were more likely to have fenced off areas. This is as expected, however the Mann Whitney U test results indicated that those who did and did not fence to manage stock were not statistically different, but the trend, as expected, does exist. The proportion of native bush / grasslands fenced to manage stock access likely favours non-farmers. In many cases, non-farmers have purchased their property for the biodiversity values and engage in efforts to protect native vegetation.
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Unstandardised Coefficients</th>
<th>Standardised Coefficients</th>
<th>95.0% Confidence Interval for B</th>
<th>Correlations</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>Error</td>
<td>Beta</td>
<td>t</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.436</td>
<td>.126</td>
<td>.019</td>
<td>-.077</td>
<td>-.859</td>
</tr>
<tr>
<td>(Constant)</td>
<td></td>
<td>.436</td>
<td>.126</td>
<td>.019</td>
<td>-.077</td>
<td>-.859</td>
</tr>
<tr>
<td>q3bus</td>
<td>Value: Sense of accomplishment from building/ maintaining a viable business</td>
<td>-.019</td>
<td>.022</td>
<td>-.077</td>
<td>-.859</td>
<td>.391</td>
</tr>
</tbody>
</table>

Table 49 Area of native bush/ grassland fenced to manage stock access inclusive model

N 173  F 4.988  R squared 0.175  P value 0.000
<table>
<thead>
<tr>
<th>Question</th>
<th>Value</th>
<th>Knowledge</th>
<th>COIC score</th>
</tr>
</thead>
<tbody>
<tr>
<td>q3pro</td>
<td>Protecting the environment and preserving nature</td>
<td>.034 .022 .111 1.520 .130 -.010 .077 .099 .118 .108 .942 1.062</td>
<td></td>
</tr>
<tr>
<td>q7pmp</td>
<td>Preparing a farm/property plan allocating land use according to land class</td>
<td>-.003 .023 -.014 -.138 .890 -.048 .042 -.273 -.011 -.010 .517 1.934</td>
<td></td>
</tr>
<tr>
<td>q7ero</td>
<td>Strategies to maintain ground cover to minimise erosion</td>
<td>.036 .026 .128 1.407 .161 -.015 .086 -.123 .109 .100 .603 1.659</td>
<td></td>
</tr>
<tr>
<td>COIC score</td>
<td>COIC score</td>
<td>-.005 .002 -.213 -2.163 .032 -.010 .000 -.355 -.166 -.153 .516 1.938</td>
<td></td>
</tr>
<tr>
<td>Knowledge of Soils</td>
<td>Knowledge of Soils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>q11pmp</td>
<td>Prepared/</td>
<td>-0.041</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td>preparing a</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>property</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>management or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>whole farm plan</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Proportion of native bush/grasslands fenced to manage stock access (=q10nata/q9own)
Table 50  Area of native bush/ grassland fenced to manage stock access inclusive model Pearson correlation

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>q3bus</th>
<th>q3pro</th>
<th>q7pmp</th>
<th>q7ero</th>
<th>COIC score</th>
<th>Knowledge of Soils</th>
<th>q11pmp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>Proportion of native bush/grasslands fenced to manage stock access</td>
<td>-0.253</td>
<td>0.099</td>
<td>-0.273</td>
<td>-0.123</td>
<td>-0.355</td>
<td>-0.322</td>
<td>-0.163</td>
</tr>
<tr>
<td>Q3bus</td>
<td>Value: Sense of accomplishment from building/maintaining a viable business</td>
<td>0.160</td>
<td>0.454</td>
<td>0.316</td>
<td>0.557</td>
<td>0.457</td>
<td>0.171</td>
<td></td>
</tr>
<tr>
<td>Q3pro</td>
<td>Value: Protecting the environment and preserving nature</td>
<td>-0.001</td>
<td>0.054</td>
<td>-0.025</td>
<td>0.017</td>
<td>0.099</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7pmp</td>
<td>Knowledge: Preparing a farm/property plan allocating land use according to land class</td>
<td>0.387</td>
<td>0.526</td>
<td>0.629</td>
<td>0.367</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7ero</td>
<td>Knowledge: Strategies to maintain ground cover to minimise erosion in this area</td>
<td>0.386</td>
<td>0.628</td>
<td>0.173</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COIC score</td>
<td>COIC score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of soils</td>
<td>Knowledge of soils</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.292</td>
</tr>
</tbody>
</table>
The restrictive model contained seven independent variables, including values (e.g. a place where to escape the pressures of life, and obtaining a sense of accomplishment from building a viable business), a belief item (i.e. pumping ground water is achievable without affecting the integrity of the aquifer), confidence in recommended practices (i.e. related to willow removal costs), and COIC [see Table 51]. The full model containing all predictors was statistically significant, $F (7, 170) = 5.32$, $p<.001$, indicating that the model explained 18.7% of the total variance of native bush and / or grassland fenced to manage stock access.

As shown in Table 51, two of the independent variables made a statistically significant unique contribution to the model: the assigned values of a place where I can escape the pressures of life ($q3esc$; assigned value), and COIC score (negative relationship). The items each uniquely explained part of the variance in the model. The item that the property allows for escaping the pressures of life uniquely contributed 2.8%, and the COIC uniquely contributed 2.6%, when the variance explained by all other variables in the model is controlled for. The COIC score again had the strongest correlation ($r = -.36$) of all the independent variables with the proportion of area of native bush / grassland fenced to manage stock access, while the item measuring the confidence in a current recommended practice item (i.e. cost of willow removal is justified by improvements in the condition of river banks and river health) was the weakest [Table 52]. As in the previous model, the negative relationship between the COIC and adoption indicates that non-farmers are more likely to have fenced native bush / grasslands to manage stock access.

A comparison of all ten models indicates that the COIC item was statistically significant in each of the five land management practices [Table 53]. In the inclusive models where COIC was not statistically significant, the statistically significant variables identified can be viewed as proxy variables for COIC (and farmer identification). The relationships and the usefulness of COIC were largely as expected.
Table 51 Area of native bush/ grassland fenced to manage stock access restrictive model

<table>
<thead>
<tr>
<th>N</th>
<th>170</th>
<th>F</th>
<th>5.320</th>
<th>R squared</th>
<th>0.187</th>
<th>P value</th>
<th>0.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables in equation</td>
<td>Unstandardised Coefficients</td>
<td>Standardized Coefficients</td>
<td>95.0% Confidence Interval for B</td>
<td>Correlations</td>
<td>Collinearity Statistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td>t</td>
<td>Sig.</td>
<td>Lower Bound</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>------</td>
<td>------------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>------------</td>
</tr>
<tr>
<td>(Constant)&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>.324</td>
<td>.143</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q3esc</td>
<td>Value: A place where I can escape the pressures of life</td>
<td>.033</td>
<td>.014</td>
<td>.186</td>
<td>2.345</td>
<td>.020</td>
<td>.005</td>
</tr>
<tr>
<td>q3pro</td>
<td>Value: Protecting the environment and preserving nature</td>
<td>.012</td>
<td>.027</td>
<td>.039</td>
<td>.439</td>
<td>.661</td>
<td>-.041</td>
</tr>
</tbody>
</table>

249
<p>| q3pre | Value: Preventing pollution and protecting natural resources | .012 | .026 | .040 | .449 | .654 | -.039 | .062 | .116 | .035 | .032 | .625 | 1.600 |
| q3bus | Value: Sense of accomplishment from building / maintaining a viable business | -.035 | .021 | -.147 | -1.644 | .102 | -.077 | .007 | -.260 | -.128 | -.116 | .625 | 1.601 |
| q4aq  | Belief: It is possible to pump ground water without affecting the integrity (water quality / level) of the aquifer | -.015 | .014 | -.079 | -1.091 | .277 | -.043 | .013 | -.143 | -.085 | -.077 | .964 | 1.038 |</p>
<table>
<thead>
<tr>
<th>q4wil: Confidence in CRP: The cost of willow removal is justified by improvements in the condition of river banks &amp; river health</th>
<th>COIC score</th>
<th>-0.005</th>
<th>0.002</th>
<th>-2.213</th>
<th>-2.277</th>
<th>0.024</th>
<th>-0.010</th>
<th>-0.001</th>
<th>-0.358</th>
<th>-0.176</th>
<th>-0.161</th>
<th>0.576</th>
<th>1.735</th>
</tr>
</thead>
<tbody>
<tr>
<td>.004 .012 .022 .299 .765 .020 .027 .092 .023 .021 .937</td>
<td>1.067</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Proportion of native bush/grasslands fenced to manage stock access
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>q3esc</th>
<th>q3pro</th>
<th>q3pre</th>
<th>q3bus</th>
<th>q4aq</th>
<th>q4wil</th>
<th>COIC score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>Proportion of native bush/grasslands fenced to manage stock access</td>
<td>.271</td>
<td>.110</td>
<td>.116</td>
<td>- .260</td>
<td>- .143</td>
<td>.092</td>
<td>- .358</td>
</tr>
<tr>
<td>q3esc</td>
<td>Value: A place where I can escape the pressures of life</td>
<td>.242</td>
<td>.289</td>
<td>.032</td>
<td>- .164</td>
<td>.053</td>
<td></td>
<td>- .258</td>
</tr>
<tr>
<td>q3pro</td>
<td>Value: Protecting the environment and preserving nature</td>
<td>.591</td>
<td></td>
<td>.119</td>
<td>- .081</td>
<td>.148</td>
<td></td>
<td>- .047</td>
</tr>
<tr>
<td>q3pre</td>
<td>Value: Preventing pollution and protecting natural resources</td>
<td></td>
<td>.113</td>
<td></td>
<td>.112</td>
<td></td>
<td></td>
<td>- .035</td>
</tr>
<tr>
<td>q3bus</td>
<td>Value: Sense of accomplishment from building/maintaining a viable business</td>
<td></td>
<td></td>
<td>.075</td>
<td></td>
<td>-.051</td>
<td></td>
<td>.568</td>
</tr>
<tr>
<td>q4aq</td>
<td>Belief: If we are careful it is possible to pump ground water without affecting the integrity (water quality and level) of the aquifer</td>
<td></td>
<td></td>
<td></td>
<td>- .016</td>
<td></td>
<td>.077</td>
<td></td>
</tr>
<tr>
<td>q4wil</td>
<td>Social acceptability: The cost of willow removal is justified by improvements in the condition of river banks &amp; river health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- .195</td>
<td></td>
</tr>
<tr>
<td>Type of behaviour</td>
<td>Dependent variable (behaviour)</td>
<td>Model type</td>
<td>Independent variables contributing significant unique contribution</td>
<td>COIC relationship to DV (p-value)</td>
<td>R²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------</td>
<td>------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------</td>
<td>------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generic (LR)</td>
<td>Area sown to perennial pasture and Lucerne</td>
<td>Inclusive</td>
<td>Q4pp, q11add, q11irr</td>
<td>0.069</td>
<td>0.488</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restrictive</td>
<td>COIC, q3occ, q3ff, q4pp</td>
<td>0.003</td>
<td>0.480</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time spent controlling pest animals and non-crop weeds</td>
<td>Inclusive</td>
<td>COIC, q2pp, Knowledge of soils</td>
<td>0.008</td>
<td>0.271</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restrictive</td>
<td>COIC, q4pp</td>
<td>0.000</td>
<td>0.233</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural focus (LR)</td>
<td>Tested soils for nutrient status where fertiliser/soil conditioners were applied</td>
<td>Inclusive</td>
<td>Q3ff, Knowledge of soils, q11fd</td>
<td>0.957</td>
<td>0.479</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restrictive</td>
<td>COIC, q3esc, q3ff</td>
<td>0.001</td>
<td>0.376</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Area with at least one lime application</td>
<td>Inclusive</td>
<td>Q2ph, q4ph, Knowledge of soils</td>
<td>0.753</td>
<td>0.379</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restrictive</td>
<td>COIC, q3occ, q4ph, q4cap</td>
<td>0.035</td>
<td>0.331</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biodiversity focus (MR)</td>
<td>Area of native bush/ grassland fenced to manage stock access&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Inclusive</td>
<td>COIC</td>
<td>.032</td>
<td>.175</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>---------</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restricted</td>
<td>COIC, q3esc</td>
<td>.024</td>
<td>.187</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** Logistic regression (LR), multiple regression (MR); $R^2 = \text{Nagelkerke } R^2$ in LR models

- Restricted to landholders who own dairy cattle, beef cattle, sheep, and/or other commercial livestock.
Conclusion

This chapter has explored the nature of the relationship between COIC (e.g. farmer occupational identity) and landholder behaviour. Five behaviour items were selected for analysis as they covered a range of behaviours (from common behaviours - area sown to perennial pasture and time spent controlling non crop weeds, agricultural related behaviours – tested for soil nutrient status and lime application, to a biodiversity focused behaviour – area of native bush / grassland fenced to manage stock access). Two types of models were tested for each behaviour: one inclusive model in which a wide range of items from various topics could be entered, and one restrictive model limited to VBN and an occupational identity item. General linear modelling indicated that COIC was helpful in predicting behaviour. As indicated in the restrictive models presented in this chapter, the use of VBN related items used for behavioural prediction could be improved by the inclusion of COIC. COIC had a positive significant relationship with four of the five behaviours selected, and a non-significant, yet negative trend relationship, with fencing native bush / grasslands to manage stock access. Consideration of the policy and management implications of this finding is found in the following Conclusions chapter [Chapter 7].
CHAPTER 7 – CONCLUSION
This final chapter revisits the main objectives of this research as stated in Chapters 1 and 3 in light of the evidence presented throughout this thesis. First, I recap the process I followed to conduct this research and what I have learned throughout this process. I then explore the key findings and the resulting contribution of the research. Finally I explore the implications for NRM policy and management and identify directions for future research efforts in this area.

Recap of the research process
In Australia and the United States rural areas are becoming increasingly multifunctional, in that many regions are no longer dominated by agriculture and are shaped by a mix of production, consumption and conservation values (Abrams and Bliss 2012; Holmes 2006). There is evidence that landholders who make their living from the land adopt different natural resource management practices from those who are part-time farmers or non-farmers (Gosnell et al. 2007; Mendham and Curtis 2010). As the non-farmer cohort of rural landholders increases, it is expected that occupational identity will be an increasingly important factor affecting NRM (Gosnell et al. 2007; Mendham et al. 2012). Previous research has typically employed self-identification or drawn inferences from data perceived as related (e.g. size of farm, off-farm income) to explore the influence of occupational identity (Mendham and Curtis 2010; Paquette and Domon 2003). These methods have been largely atheoretical. Indeed, most quantitative studies have simply asked respondents to self-declare their principal occupation and the development of rural landholder typologies has largely been without reference to identity theory. This approach may be sound (Groth et al. 2014), particularly where identity is not expected to be a critical variable, but self-declaration draws on only one of the seven dimensions of collective identity theory.

The inconsistent use of a single approach to classify landholders is problematic when attempting to compare landholders based on varying factors; the baseline for landholder classification shifts with each approach employed. The implementation of some variables (e.g. number of dairy cattle, sheep, beef cattle) is not relevant to all rural landholders and the use of such measures is flawed.
Research in other contexts has resulted in the development of a theoretically derived measure of occupational identity known as the Collective Identity Construct (CIC) (Ashmore et al. 2004). This construct appears to provide a solid foundation for researchers setting out to explore the nature and role of occupational identity in NRM. The use of a farmer occupational identity is a descriptor that many rural landholders can relate to. Testing the efficacy and utility of such an approach to classify rural landholders; developing a valid and reliable theory-based landholder typology; and exploring the relationships between landholder farmer identity and land management practices was the focus of this research.

The three objectives of this research were to:

1) determine if it was possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC) by
   A. assessing if CIC could distinguish between farmers, part-time farmers with larger rural properties and non-farmers with small/lifestyle properties;
   B. assessing if the CIC was able to distinguish rural landholders in different contexts (i.e. different countries);
   C. determining if the seven dimensions of CIC form a valid and reliable scale to measure a farmer occupational identity (OI) amongst rural landholders, and assess if some dimensions of CIC are better predictors of a farmer OI amongst rural landholders;

2) assess whether a farmer occupational identity scale based on the CIC could provide a valid and reliable theory-based typology of rural landholders; and

3) examine the nature of the relationship between farmer identity and the land management of rural landholders.

I had previous experience working with and analysing both qualitative and quantitative data and have seen the benefits of using both in conjunction with each other. I began my research with qualitative interviews. This allowed me to become familiar with the role of occupational identity in an agricultural context as most literature has placed limited attention on the importance of this topic. To determine if the CIC can
distinguish between different types of landholders and do so in different contexts, two case study sites were selected.

The first location was in north eastern Ohio, USA and the second study site was in North Central Victoria, AU. In each study site I selected 20 participants. I transcribed each interview verbatim and coded my data using largely the predefined CIC dimensions as nodes in QSR NVivo. Each line of text was checked for applicability of a dimension and in some cases one piece of text was applicable to numerous dimensions. The qualitative phase also allowed me to gain a greater understanding of how each CIC dimension was relevant to each cohort and how best to ask a question addressing each dimension, which was important as this set the groundwork for the survey statements included in the postal survey.

The next stage was the quantitative data collection. Survey statements were trialled through pilot testing workshops. The comments from the workshop allowed the survey statements to be refined. For example, the term ‘farmer’ was modified to ‘agricultural producers’ to more adequately reflect the wide variety of farmers in the region.

Quantitative data analysis was completed in SPSS version 20. Tests including pairwise comparisons (Kruskal-Wallis H Test, Mann Whitney U Test), correlations, Cronbach alpha, principal component analysis, general linear models and means testing were used.

**Reflection of the approach**

The research approach allowed me to gain a greater understanding of a farmer occupational identity. The reliance and importance of the pragmatic worldview employed, the pitfalls that can be associated with research, and the methods to overcome the impediments have deepened my awareness and capability as a researcher. These hurdles have resulted in invaluable learning experiences.

**The pragmatic worldview**

Pragmatism, a ‘theory of truth’, is reliant upon experience and interactions in society that lead to consequences and meanings (Denzin & Lincoln, 2013). It is through interpretation that meaning is assigned and ‘truth’ is achieved. The flexibility of the
pragmatic approach meant that I could draw on my personal experiences, both in the field and my personal background, those of my supervisory team, and individuals in workshops to inform, interpret and assign meaning to the data answering the research questions.

In pragmatism, the research question takes precedence over the method or the philosophical worldview (Creswell & Plano Clark, 2007), and researchers use all approaches available to gain understanding (Creswell, 2009). Rejecting the either/or approach of qualitative or quantitative data collection and employing the pragmatic worldview utilising mixed methods has provided depth to this research that would otherwise have been fairly singular. Letting the research questions drive the research approaches has allowed flexibility in drawing on both qualitative and quantitative data to answer the research questions. It is in employing this “what works” approach (Creswell & Plano Clark, 2007) that has led to the successful completion of this PhD research; adopting a different worldview would not have allowed for the depth of understanding to be collected relative to the research questions. For instance, the postpositivist paradigm, largely associated with quantitative approaches, would have meant that the research question addressing whether the CIC was able to distinguish rural landholders in different countries would not have been answered; this question drew on the qualitative data collected from two countries. Likewise, implementing the constructivism paradigm, most often associated with qualitative approaches, would have meant that the statistical rigour associated with the large postal survey dataset testing validity and reliability would have been unachievable.

Pragmatic researchers tend to view research as a holistic endeavour and are inclined to discount the potential dichotomy of qualitative or quantitative research (Onwuegbuzie & Leech, 2005). Having immersed myself in the world I researched is important as it allowed me to draw upon my personal farming background. This was helpful as I spoke to rural landholders in the United States; I was able to connect and understand, perhaps to a greater degree than a researcher without a similar background, to those individuals, their practices, identification and thought processes. My farming background again was extremely helpful in understanding and questioning the land management practices the Australian landholders implemented. I was able to quickly see parallels and differences in the extent and relevance of the CIC dimensions.
and impetus for decision-making within both countries. The pragmatic approach, and the use of a combination of qualitative and quantitative data allowed me to “test” the utility of the CIC dimensions to separate rural landholders in different ways. For instance, while the Australian qualitative data provided more mixed reviews of the utility of the CIC dimensions, the quantitative data allowed for the creation of a valid and reliable collective occupational identity construct (COIC) to be developed. Throughout qualitative data collection I reflected on the appropriateness of each of the CIC dimensions. This reflection proved to be appropriate and useful when interpreting the quantitative dataset.

**Research impediments and solutions**

Time management and flexibility have proven to be paramount. First, when I started snowball sampling in the United States I had difficulty securing names and contact details for non-farmers. I had to adjust and expand my original focus of purposeful snowball sampling to include the assistance of the GIS department in Wayne County, Ohio to provide contact details for non-farmers. This required an adjustment on my end to try to adhere as closely as possible to my original timeline. Second, flexibility was required when relying on a third party (i.e. NC CMA LGA staff) to obtain landholder information. Expected timeframes of obtaining access to landholder residential and property data had to be adjusted due to longer than expected wait times in securing the data; resulting in an ultimate delay in postal survey data collection. These impediments in the research process meant that I had to be flexible in my data collection and analysis which ultimately led to more time spent on the qualitative data analysis and quantitative survey statement development.

A separate challenge was ensuring that a representative sample of landholders were included in the case study component of the research given my small sample sizes. I had to carefully look at the attributes of landholders being suggested as potential informants to ensure that each landholder provided a slightly different perspective from those already interviewed. In the Ohio context, for instance, it would have been easy to interview landholders who were very similar in their background, occupation, and land size. However, interviewing those sharing very similar characteristics was not
my intent. My intent was to interview a cross section of landholders who were representative of the population.

Through this research I have also learned various techniques for assessing the extent non-responses might lead to a biased sample. Non-response bias can be addressed through different approaches including comparing respondents with the population the sample was drawn from or comparing respondents and non-respondents (Armstrong & Overton, 1977; Groves, 2006). The former is often reliant on a limited range of data and the latter can be achieved by contacting non-respondents, typically via a phone call, and gathering a limited range of data found in the survey. Limitations exist in both methods; population census data are based upon the entire population (urban and rural) – separating the census into a direct comparison of a sample is nearly impossible. The approach I adopted required comparisons of survey respondents with the wider population of rural landholders. A challenge was finding ‘matching’ information between the data collected in the postal surveys and Australian census data. Perseverance was required when utilising the unfamiliar government website to find comparative data. In many cases the data presented on the government website could not be broken down to a regional scale and finding data of acceptable comparison was a challenge. Non-response bias was ultimately tested by comparing survey data for five items (mean age of respondents, gender, property size, length of property management and participation in landcare) with data for the NC CMA region collected by the Australian Bureau of Statistics through their farm surveys. Comparisons were made using a 95% confidence interval; results suggest the survey respondents are representative of the wider cohort of rural landholders in the region.

A separate challenge was managing a large data set. My previous experience handling large data sets provided the framework for appropriate management. The dataset used in this research was the most extensive I have used to date, however my previous experience of utilising SPSS led to relatively smooth process. Keeping an accurate and detailed codebook of variable names, descriptions and measurement scale ensured relatively few complications in the data analysis. In addition, each day after any modification of the data set I saved the file with a new name ensuring that I could a) undo my work if necessary, and b) track any changes made in the progress of analysis. Another extremely helpful ‘shortcut’ that I learned during my data analysis was the
use of SPSS syntax. This shortcut of using program codes allowed for easy manipulation of tests run, output, and variables included in each test. This shortcut meant that I did not have to repeatedly go back through the program menus each time, selecting various tests and variables of interest.

Working with an industry partner, while it did provide some initial setback regarding timeframes, has also allowed access to landholder property information and provided additional credibility to the survey efforts. The existing relationship between the NC CMA and the landholders selected to receive the postal survey likely helped bolster the response rate. The data received is also spatially referenced. This added benefit allows for a closer examination of landholders based on a variety of variables (e.g. the environmental assets of biodiversity, wetlands, and waterways on participant properties, as determined by the NC CMA). This added benefit of spatially referenced data allows for a deeper analysis than what could be obtained on a catchment level. Spatially referenced data will allow for further analysis of the data.

**Drawing upon theory**

The underlying theory of the Collective Identity Construct has allowed me to gain an understanding of how identities are formed and how the motivations for modifying behaviour to maintain a certain identity are enacted. For example, the Identity Theory framework explains how individuals adjust their behaviour based on their internal definition of what it means to hold a certain identity (e.g. a farmer) and how the feedback from the environment (e.g. society) guides an individual's reaction to maintain their current behaviour or modify it to more closely align with personal and societal expectations. Social Identity Theory provides a closer lens on the ‘us vs. them’ phenomena. Some farmers in this research for instance provided information on the different types of farmers (e.g. hog farmers, dairy farmers, organic farmers) and emphasized the similarities between other similar types of farmers in a positive fashion. At the same time these farmers were distancing themselves from farmers who were ‘different’ than themselves and tended to provide criticism of ‘them’ (the different farmers). These theories allowed me to understand the ‘good farmer’ concept and identity. Research has proven that farmers want to be seen in a positive light and often modify their behaviour if they are being portrayed negatively (Burton,
2004b; McGuire, et al., 2013). These theories helped to understand why that is the case.

The Collective Identity Construct allowed a more thorough inspection of the dimensions that incorporate a collective identity. Instead of looking at an identity at a high level, this construct provided the foundation to tease apart the farmer identity and how this descriptor is applicable to rural landholders in general. The use of this construct’s dimensions, ranking each dimension in the qualitative data and creating the COIC in the quantitative data, has drawn from the Nigrescence Model. On one end of the spectrum of this model an individual is unaware and does not identify with an identity. The model progresses through the stages of identity adoption with the opposite end of a spectrum resulting in full identity adoption. Instead of using the Nigrescence Model to illustrate the change of identity in an individual, I have drawn on it to illustrate how a farmer identity is a guiding force in the various rural landholders of this study. The landholders fall along the spectrum based upon their farmer identification. Each of the theories presented in this study provided the insight needed to interpret the data.

Lessons learned

Throughout this process I have conducted steps in the research process that, in hindsight, were perhaps not as necessary as I originally thought. For instance before I ranked all of the interviewees in the case studies, I created single CIC dimension summaries for each interviewee. In these documents I listed every dimension and corresponding element, provided the number of times a piece of text was coded to a particular node, provided a quotation that was the best representation of that dimension and then provided a comment on how the comment fitted in with the larger scheme of the interview. This was helpful in that the USA case study was the first ‘exploratory’ site in which I was gaining insight into just how occupational identity might be factoring into a person’s life. Conducting this step of CIC summaries allowed me to reflect, consider, and express how the dimensions either did or did not apply to certain individuals. This process, while not conducted for the AU interviews, allowed for a comparison between the two countries to come more naturally to me as I had, by
that time, gained a deeper understanding than before I began interviewing. In hindsight, this step could have been omitted to conserve time.

I have also learned the benefit of allowing time to reflect on the interview content. If the time between the interviews and sending out the surveys had been shortened the outcome may have been different. I used the time to re-evaluate the survey statements and properly test the items before implementing the survey. This added time to test the content, structure, and word choices of the survey statements has undoubtedly provided a more favourable outcome. Foregoing pre-testing the instrument would have resulted in either potential misunderstanding, misinterpretation, or no response to survey items.

Through the quantitative data analysis process, I have learned the importance of getting to know the data before starting analysis. Running descriptive statistics, looking at the missing cases, and questioning the data set is important in ensuring a ‘clean’ dataset is available. Through reading, testing and interpretation I have come to learn much more about the different types of statistical tests available and am more confident and comfortable in my decision making process. Inaccurate or incomplete data inhibits data analysis. A clean data set is also important as one works through collinearity issues.

Multicollinearity was an issue in the modelling. Variables were checked for multicollinearity using correlations (e.g. correlation matrix) and the variance inflation factor (VIF) to ensure multiple items were not strongly correlated. Variables with correlation values above 0.9, or where there were several correlations greater than 0.7, were removed. A number of items addressing soil knowledge were combined using principal components analysis as some correlations between the soil knowledge variables indicated potential multicollinearity. After this adjustment, none of the independent variable VIFs selected for testing exceeded Vaske’s (2008) recommended threshold of 4.0.

Through the course of both the qualitative interviews and quantitative surveys I have come to understand the deeper elements of occupational identity. Before commencing the doctoral program I was aware of some of the limitations and implications of occupational identity on land management practices, but I have never
before considered the factors that make up occupational identity as a whole. Learning about the Social Identity Theory, Identity Theory and Self-categorization theory and the Nigrescence Model have given me a new appreciation and understanding of in-group vs. out-group behaviour, our conditioned response to adjust our behaviour to fit in with the social norms, and how we consider ourselves as a part of a whole. The outside influences and pressures guide our behaviour, but are also deeply seated in the theory of values, beliefs and norms. This research has provided evidence that the developed COIC is beneficial in explaining a unique contribution to the prediction of land management behaviour in the areas of agriculture, biodiversity/conservation, and generic practices. This research has highlighted the complexity of occupational identity and has set the foundation of my understanding and comprehension of occupational identity in a natural resource context.

Key findings

Research question 1 – Is it possible to classify rural landholders based on a farmer occupational identity using Ashmore et al.’s collective identity construct (CIC)?

Through the course of the qualitative data analysis a number of things became clear. First, most CIC dimensions are useful in separating different types of landholders. However, there appears to be a difference in the utility of individual CIC dimensions between the USA and AU contexts. In the qualitative portion of this research, I classified landholders as either non-farmers, part-time farmers or full-time farmers. In the USA, FTF were the most passionate and displayed the highest levels of farmer identity in the form of influence and importance on their sense of self. However, in the AU case study a different picture emerged. Here the part-time farmers and the full-time farmers were the two types of landholders who exhibited the strongest connection with a farmer identity. This was a bit surprising as the full-time farmers owned larger parcels than the part-time farmers. Relying on the proxy variable of property size, the presumption could be made that those with larger property sizes would work more on the property and would in turn have a higher farmer identity. In fact, because of this large overlap between the part-time and full-time farmers, separating landholders based on the seven CIC dimensions became much harder than in the USA case study. The USA study exhibited an inner grouping of landholders (e.g. non-farmers with non-farmers, part-time farmers with part-time farmers, full-time
farmers with full-time farmers) within the overall category of landholders in general. In the AU case study however, non-farmers mixed to a higher degree with some part-time farmers, and part-time farmers also mixed to a larger degree with full-time farmers than in the USA context. Some AU part-time farmers rated the highest on some CIC dimensions – this was opposite to what was found in the USA case study. Overall, however, the CIC dimensions were able to distinguish the three types of predefined cohorts as exhibited in Chapter 4, but the CIC worked differently between locations in the qualitative case study comparison.

I attribute this lesser degree of farmer identity (i.e. in Australia) of those individuals who farm full-time to a number of factors largely outside of a landholder’s control. Through the course of the interviews I learned that a high percentage (estimates of up to 25% of landholders provided by interview informants) of landholders had to exit farming because of the “millennium drought” (van Dijk, et al., 2013). Between the years 2001 and 2009, south eastern Australia “experienced the most persistent rainfall deficit since the start of the 20th century” (CSIRO, 2011). Annual rainfall was 73 mm (2.9 inches) below average (12.4% below the 20th century mean) for the 1997-2009 time-period. In conjunction to the decrease in water supply, the price of irrigation water from the Catchment District rose dramatically forcing many farmers (especially those in the dairy industry, which require large volumes of water) to exit farming altogether. The price of water became too expensive and out of the reach for many landholders who were struggling to get by before the drought set in. Stories of farmers falling into depression and committing suicide emerged over the course of the AU interviews. It is clear that those who held the strongest farmer identity had the most to lose if their farm was no longer viable. Tales of livestock starving to death and of owners shooting stock to end their suffering also emerged. The connection between a strong farmer identity and the effect of distancing oneself from the occupation consuming and defining who you were became apparent. It is possible that some full-time farmers, who unlike American landholders who often have larger subsidies to tide them over, use the ‘lack of’ connection of a farmer identity as a defence mechanism in case things get worse and they too will be forced out of the agricultural industry. Another possible explanation is a religious element to the differences. The USA farmer identity may be strengthened by generally strong religious values, beliefs, norms -
much more so than in Australia where religion is generally not a strong socialising influence.

This period of hardship however has allowed for considerable changes in the NC CMA region. Landholders selling land, and water entitlements, have opened up the door to those landholders who were either looking to expand or allowed large blocks to be split up allowing other non-farmers to enter the property market. This seems to have accelerated the multifunctional transition in Northern Victoria, while the rate of turnover in landholder types seems to be more consistent in the Ohio North East. The safety net of the USA federal government in the form of agricultural subsidies for American farmers has provided some additional stability in the area.

The dimensions of the CIC found in the COIC account for this emotional connection with farming. The COIC is based on the highly cited CIC, which in turn, is based on widely accepted theory supporting claims for the validity of the COIC. Specific tests were undertaken to assess the reliability and validity of the COIC and the scale met all of those tests. Through the course of quantitative analysis the items were tested using multiple methods and ultimately one component (agricultural occupational identity) was extracted. A 12-item scale labelled the COIC was identified. The COIC had a high Cronbach alpha, and low inter-item correlations suggesting that, this 12-item scale is reliable and valid. The COIC embraces six of the seven CIC dimensions, including the core dimension of self-categorisation. Interestingly, Stoner et al. (2011) developed a scale (outside of NRM and agriculture) that incorporated the same six dimensions that this research also found to be relevant (e.g. reliable and valid). Many of the proxy variables used in the past to identify landholder types were correlated with individual COIC scores. For example, there were expected relationships between property size, time spent working on and off property, returning a profit, membership affiliation and land use / enterprise type and COIC scale scores. COIC, developed in this research, was able to effectively distinguish landholders based upon those measures. Importantly, COIC was able to differentiate between respondents who self-declared as full-time, part-time and non-farmer landholders. Again those relationships were as expected. Analysis of the Australian survey data led to the removal of items exploring the dimension of “content and meaning” that were part of the Ashmore et al. (2004) CIC.
In both previous (e.g. Stoner et al. (2011)) and present research, the dimension “content and meaning” has not been included in the development of a scale.

**Research question 2 - Can a farmer occupational identity scale based on the CIC provide a valid and reliable theory-based typology of rural landholders?**

COIC was used to create a landholder typology that exposed the similarities and difference between types of landholders (Chapter 5). This research has found that four types of landholders is the most representative and reflective of the types of landholder in the NC CMA: full-time farmers (48%), part-time farmers (31%), hobby-farmers (11%) and non-farmers (10%). The ‘non-farmers’ cluster had the smallest median hectares owned (20 hectares) and these landholders were more likely to focus on the recreation and biodiversity values of their property. The ‘non-farmers’ cluster exhibited the highest level of concern regarding environmental values (e.g. importance of native vegetation) and biospheric values (e.g. the protection and prevention of harm to the environment). The ‘hobby farmers’ cluster operate small properties (median of 31 ha) and these landholders are more similar to the ‘non-farmers’ cluster where the focus is on conservation and recreation values compared to the ‘part-time’ and full-time’ clusters where the focus is increasingly on production and business aspects of property ownership. ‘Hobby farmers’ are more likely than the ‘non-farmers’ to emphasise the importance of the productive value of the soil and the obtaining a sense of accomplishment from producing food and fibre.

The ‘part-time farmers’ own much larger properties (median 100 ha) than the ‘non-farmers’ or ‘part-time farmers, but much smaller properties than the ‘full-time farmers’. This cluster places higher value on building a viable business and producing food and fibre in comparison to the ‘non’ and ‘hobby farmers’. In addition, ‘part-time farmers’ are more likely to earn a profit from their property, be involved in Landcare and have family interested in taking over the property in the future compared to both ‘hobby farmers’ and the ‘non-farmers’. ‘Full-time farmers’ owned the largest properties (median 770 ha) and were most likely to report a profit and to indicate they were planning for family succession for their properties. This cluster placed the greatest emphasis on their commitment to family (e.g. ‘ability to pass on a healthier environment for future generations’ and ‘looking after my family and their needs’).
‘Full-time farmers’ emphasised the importance of values related to production of food and fibre, building a viable business and supporting their families even more so than ‘part-time farmers’. ‘Full-time farmers’ were less likely to emphasise recreation or environmental values than the other clusters.

Analysis of these four types indicated that full and part-time farmers were more similar than previously hypothesised. Existing research tends to group part-time farmers with the non-farmer cohort, when it appears that the part-time farmers are more in-line with the full-time farmers on a range of issues/practices, in the study population. The availability of the spatially referenced data will allow the data to be further examined for patterns exhibited across the landholder types.

**Research question 3 - What is the nature of the relationship between farmer identity and the land management of rural landholders?**

Finally, as evidenced in Chapter 6, COIC can predict landholder land management practices. Five management practices were selected to explore the nature of the relationship between COIC and behaviour. Two common practices or behaviours were identified that would be relevant to most landholders, regardless of whether their farm enterprises had a cropping or grazing focus: (1) ‘area sown to perennial pasture and Lucerne’, and (2) ‘time spent controlling pest animals and non-crop weeds’. Two practices with a production focus were included and the expectation was those landholders who identified more readily as a farmer (and had a higher COIC score) would be more likely to have engaged in those practices. Those practices were: (1) ‘tested soils for nutrient status where fertiliser / soil conditioners were applied’, and (2) ‘area with at least one lime application’. Lastly, a management practice with a biodiversity focus was also included: (1) ‘area of native bush / grassland fenced to manage stock access’ as most landholders had some native bush/ grasslands on their property. Pairwise analyses indicated a positive, statistically significant relationship between COIC and four selected behaviours: land sown to perennial pasture and lucerne, time spent controlling pest animals and non crop weeds, tested soils for nutrient status where fertiliser / soil conditioners were applied, and area with at least one lime application over the full period of management. COIC held a negative trend,
yet non-significant relationship with the practice of fencing native bush / grasslands to manage stock access.

General linear modelling was used to explore relationships between independent variables, including the COIC and the implementation / adoption of the five practices. The expectation was for a significant positive relationship between COIC scores and four of the five tested behaviours. Respondents having a stronger farmer identity (i.e. higher COIC score) were expected to be more likely to have engaged in sowing perennial pasture and lucerne, controlling unwanted animals and weeds, testing soil nutrient status, and applying lime compared to those having a weaker farmer identity (i.e. lower COIC score). Pairwise analysis of COIC scores and each practise provided evidence of these expected relationships between COIC scores and sowing perennial pasture and lucerne; controlling pest animals and non-crop weeds; testing soils for nutrient status where fertiliser / soil conditioners were previously applied; and having applied at least one lime application over the full period of their management.

It was also expected that there would be a significant negative relationship between COIC scores and the practice of fencing native bush / grassland to manage stock access. The underlying assumption was that respondents with lower COIC scores would place a higher value on biodiversity and the aesthetic appeal of their properties than those with higher COIC scores (i.e. stronger farmer identity). That assumption was based on previous research findings (e.g. Klepeis, et al., 2009; Mendham, et al., 2012), and confirmed by the typology descriptions for full-time farmer/part-time farmer compared to hobby farmer/non-farmer. Pairwise analysis confirmed the expected trend but the results were not significant. Overall general linear model testing confirmed that COIC is a variable that contributes a statistically significant unique contribution in predicting each of the five behaviours selected.

**Contribution of research**

The research has contributed to the wider literature in two major ways: the development of a valid and reliable scale; the creation of a theoretically sound landholder typology; and evidence of the usefulness of the COIC to predict landholder behaviour.

270
1. Developed and demonstrated the reliability and validity of a scale to measure farmer occupational identity

Emtage et al. (2006) have highlighted that there has been limited attention to the non-farming cohort of rural landholders despite evidence that non-farming identities are likely to be significant influences on NRM in rural landscapes. Some quantitative studies have asked respondents to self-declare their occupation using either the selection of a pre-defined descriptor or an open-ended question (Curtis and Mendham, 2012; Race et al., 2012). This approach has been shown to effectively distinguish farmers and non-farmer landholders (Groth et al., 2014; Postmes et al., 2013). However, using self-declaration to derive a collective (and occupational) identity draws on only one dimension of what may be conceptualized as a multi-faceted concept.

Studies show that the farmer self-concept is multi-faceted and is comprised of multiple identities within itself (e.g. agricultural producer and/or conservationist) “each with different notions of what comprises good farming practice and each capable of becoming the focus for action” (Burton and Wilson, 2006, p. 100). The concept and implications of ‘good farming’ (Burton, 2004; Burton and Wilson, 2006) and the deep connection to farming (Vanclay, 2004) are two variants of the importance of a farmer occupational identity. Indeed, the autonomy associated with farming is viewed as a core value of a farmer identity (Stock and Forney, 2014). Competition from other farmers (Emery, 2015) and the fear of exposure of bad land management (Emery and Franks, 2012) influence the behaviour of landholders.

While the definition of ‘good farming’ ideals (Sutherland and Darnhofer, 2012) can change with context so too does the perspective of farm life of someone that has off-farm employment (Sutherland, 2012). This change from a full-time to a part-time farmer may compromise the individually held definition of a ‘real farmer’ (Forney and Stock, 2014). The shift of occupations in the farming community lead to confounding results of identity measures that rely on self-declaration as individuals may now relate to more groups than before (Wilson et al., 2013). Often, rural landowners exhibit and identify with multiple characteristics of a variety of landholders and may not be willing to associate with a term that is identified as socially undesirable (Howden and Vanclay,
These trends complicate what being a farmer entails as conceptualisations of this term may be influenced not only by engaging in agricultural production but may also include a variety of other concepts that were not traditionally linked with the concept of a farmer identity.

The strength of the research conducted in this study is that the quantitative data analysis indicated that the 12-item COIC provides a valid and reliable scale for use by NRM researchers. Six of the seven CIC dimensions (i.e. behavioural involvement, self-categorisation, importance, social embeddedness, evaluation, attachment and affective commitment) provide a comprehensive set of dimensions grounded in sound theory for use in future research exploring the nature and role of occupational identity in the NRM context. The survey statements leading to that conclusion were formulated in a way that they could easily be administered to landscapes that are facing rural transition in other nations with developed economies.

Through this analysis, one dimension (i.e. content and meaning) was found to be comparatively unhelpful in separating rural landholders. This finding was important as the highly used CIC has not been used in a natural resource context. Dimensions of CIC (e.g. behavioural involvement and self-categorization) have appeared in research exploring types of landholders, but the use of every CIC dimension has never been attempted. This research has utilised CIC to develop the COIC targeted specifically at a farmer occupational identity. The COIC was found to successfully separate three pre-identified categories: full-time farmer, part-time farmer, and non-farmers.

2. Established that the COIC can be used to develop sound typologies of rural landholders; and developed a typology that enhanced understanding of heterogeneity amongst rural landholders and assisted in identifying important spatial patterns.

The COIC was also utilised to create a landholder typology and profile of landholders in North Central Victoria using Principal Component Analysis / cluster analysis. The created typology highlights an important finding in the usefulness of assessing the relationship of a farmer identification and behaviour. The COIC resulted in four types of landholders being identified: full-time farmer, part-time farmer, hobby farmer, and non-farmer. While these similar are to those found in Wilson (2007), the same theoretical underpinning was not present.
The additional segmentation of landholders provides more nuanced information about the types of landholders. The finding of four different cohorts illustrates the heterogeneity amongst rural landholders. Other research efforts have resulted in landholder typology creation but this research differs from other efforts who broadly classified landholders into two broad cohorts (e.g. Abrams & Bliss, 2012; Raymond & Brown, 2011). In other separate research, the use of financial profit motives (Sorice, et al., 2012) and property size (Holloway, 2002) led to the identification of three cohorts in two separate studies. This research however indicates that while property size and financial considerations do play a role in land management decision making, it is not the sole factor in management determination. Through this research, the part-time farmer cohort was found to be more similar than previously thought to the full-time farmers, yet this research has highlighted their differences in motivations and level of farmer occupational identity. Similarly the distinction was made between non-famers and hobby farmers. Other studies have not highlighted the differences found between these two cohorts and have simply combined the two (e.g. Sorice et al., 2014).

3. COIC is a useful measure in predicting landholder engagement of land management practices.

A number of tests were undertaken to explore the relationship between farmer identification (i.e. COIC scores) and land management behaviours. Pairwise analyses indicated a statistically significant positive relationship with four behaviours (two ‘non-specific’ behaviours and two agriculturally focused behaviours). A non-significant negative relationship was observed between COIC and a behaviour with a biodiversity focus.

General linear modelling indicated that models predicting behaviours are stronger with the inclusion of COIC. COIC is an integral part of what determines behaviour. As this research highlighted, individuals with lower COIC scores are generally more concerned with the recreational, aesthetic or environmental assets associated with owning a property. Those with higher COIC scores are generally focused and motivated by economic or production assets/values. As previous efforts utilising the CIC
dimensions in an NRM context do not exist, no direct comparison is possible between my findings and that of other attempts.

This COIC construct is hypothesized to be applicable to a range of contexts as the COIC is not specific enough to be restrictive. For example the focus of this research was not on a specific type of landholder (e.g. peanut farmers or dairy farmers), but encompassed the range of landholders. A simple manipulation of the statement and replacement of the identity group in question could easily make the COIC useful elsewhere in other contexts. In addition, the ‘generic’ nature of the statements would hypothetically allow for these statements and construct to be tested in other contexts without a great amount of statement manipulation.

Implications for policy and management

The findings in this research have application for both policy development and management. An agency may develop an overall policy for a catchment, but then tailor that statement of intent to suit the different types of landholders. For instance, local NRM agencies are able to utilise the findings of the COIC based landholder typology to target their agenda based on the landholders in a given area. The agencies will be able to target landholders by drawing on their motivations for owning property: non-farmers and hobby farmers are motivated by the biodiversity appeal of their property, while part-time and full-time farmers are driven by the productive capabilities of their soil. The implementation of particular policies can also be tailored to suit each type of landholder. An example of this tailored approach could be found in the way in which NRM officials reach out to landholders. The conventional 9 a.m. to 5 p.m. work hours will likely suit the full and part-time farmers who can be found around their property at some point during the normal workday. The same cannot be said for the non-farmers or the hobby farmers or many of the part-time who often have off property work, which excludes these cohorts from the face-to-face communication with NRM officials during the normal working week.

In addition, land management officials can segment the landholders in their district to create specific and compelling, rationale and incentives for partaking in a land management practice. Previous natural resource management efforts might be viewed as ‘wasteful’ in that the focus has been on the ‘wrong’ target population. In the North
Central CMA, the area is still dominated by full-time farmers (i.e. 48%), with part-time farmers also making up a substantial proportion (i.e. 31%) of the rural landholder population. However, these two cohorts are more concerned with production and running a successful business. Two separate cohorts, who together account for 21% (i.e. 10% non-farmers; 11% hobby farmers) in the catchment, are more focused on the biodiversity and conservation aspects that their property provides (Chapter 5). These individuals would be more open and easily persuaded to modify or conduct land management practices based on their core biospheric values (e.g. protecting the environment and preserving nature). In some environmental assets (e.g. biodiversity) these two cohorts account for a larger portion of the population. Approaching these types of landholders might prove more beneficial to the agency as they would be an easier target of landholders to ‘get’.

For these cohorts, a focus on the increase in biodiversity and aesthetic appeal or recreational opportunity could perhaps be a greater incentive than any monetary incentive provided. Funds directed at this smaller segment of the population could produce a bigger reward for less cost. The use of spatially referenced data could pinpoint the type of landholder and inform NRM officials of the best course of action to achieve compliance with policy. Full-time and part-time farmers should be approached with a productive or economic angle. That is, presenting these landholders with the economic benefits of engaging in biodiversity friendly behaviour (e.g. planting native species to act as a windbreak, livestock shelter, and wildlife habitat). Research has found that a farmer identity is useful to predict, in a general sense, how a farmer may respond to a specific management policy (McGuire et al., 2015). Agency officials will have to consider how to modify the working schedules, the approach taken, the focus of promotional material, etc, to best achieve a set goal for their catchment while using the least amount of resources.

Separately through this research, the part-time farmer cohort (at least in Australia) was found to be more similar than previously thought to the full-time farmers. This realization provides an advancement to how the types of landholders are perceived and their corresponding motivations for conducting current recommended practices. In the region studied, it is clear that it is inappropriate to assume that landholders are either farmers or not. Nor is it appropriate to view landholders as three different types
(e.g. full-time farmer, part-time farmer, non-farmer) as each is different from the other. Each cohort places varying levels of importance on the biodiversity, recreation, productive value and business viability of their property. Even though similarities exist, this research has provided data showing that each of these landholder cohorts has different motivations for owning land and each cohort are ‘driven’ by different incentives [Chapter 5]. With this information, NRM agencies can use their limited resources to more effectively target individual landholders.

Future research

As this is the first effort to contextualise a collective farmer occupational identity construct utilising all of Ashmore et al.’s (2004) CIC dimensions, there is room for further testing and refinement of the construct. Further testing in different social, economic and environmental contexts is important to advance the utility of this construct.

This research drew on data for a large sample (n=1,941) of rural landholders and established that the COIC was a reliable and valid measure of farmer identity in a region that can be described as multifunctional (Barr, 2003; Barr et al., 2005) and is typical of many regions in south eastern Australia. For this reason, I believe I can extrapolate the findings to the rest of Victoria. Nevertheless, further regional studies that include the COIC or a revised version will need to be undertaken and similar tests for reliability and validity undertaken to test the extent the scale “works” in other contexts. Additional research is needed to undertake quantitative studies in the United States to assess whether all CIC dimensions can be included in a reliable and valid COIC scale for use in the USA.

Through the course of the qualitative interviews the dimension of ‘content and meaning’, which is largely based on a historical connection, was found to be unhelpful in separating landholders. Ashmore et al. (2004) stated that the element of ‘content and meaning’ was best addressed in a qualitative manner. The question arises of whether there are ways to include this dimension in a quantitative survey. In addition are there other elements or dimensions missing from the construct? Moreover, there may be other dimensions influencing a farmer occupational identity that are excluded from the COIC scale. For instance in some cases the issue of intergenerational transfer
succession could be included in a scale as that was a reoccurring topic during the interviews. Whether the inclusion of such a topic into the COIC would offer improvement is yet to be seen. With that said, the dimension of intergenerational succession is underpinned, and is apparent, in the qualitative form of the dimensions ‘importance’ and ‘evaluation’. Inclusion of this concept could be accomplished by examining landholders long-term plans, plans for succession, and the extent that a succession plan exists. This new variable could then be tested for reliability and validity to be part of an expanded scale.

Through this research we have seen that those with higher values of COIC (i.e. full-time farmers) are often more concerned with caring for their family needs and believing that their property is a good place to raise a family, but does a connection exist between COIC and family values that warrants inclusion into the COIC? As this was the first instance of fully utilising CIC in a natural resource setting, more work is needed in this area. Further trialling and refinement of survey statements could test that statement in a natural resources setting. An example statement could be, “My rural property provides the opportunity to look after my family and their needs”.

There is a clear need for more collaborative research across the disciplines in the occupational identity literature. Collaboration between social scientists and ecologists, biologists or agronomists would lead to a greater understanding of the intricacies of potential motivation of farming behaviour. Physical scientists could provide detail regarding soil condition, plant growth, or environmental response to soil conditioners to depths which is likely outside of the realm of most social scientists. Collaborative work spanning nations could lead to enhanced understanding of the implications of such a shift in categorising landholders and the resulting wider implications for communities and regional areas. Moreover, more cross-country comparisons to more fully test the CIC and COIC constructs will allow for a better understanding of how views on identity may vary across nations. Part of this research has highlighted that while this research was useful in both contexts (i.e. USA and AU), the construct worked to differing degrees. The qualitative application of the CIC dimensions appeared to be more useful in the USA context than in the AU context. This is an interesting finding as it highlights that occupational identity, at least in a farmer identity context, may have different factors influencing the adoption of such an identity. The quantitative
application of the CIC dimensions worked well in the Australian context, but more research should be done to identify why those differences exist.

Researchers can employ the COIC to develop theory-based typologies of landholders, which would address what I see as a major weakness in many of the typologies previously developed. At the same time, soundly based typologies that include measures of values, beliefs, and norms (VBN) and some of the “levers” that NRM practitioners employ, such as platforms and processes that engage and build human and social capital, may lead to heuristics that provide useful guidance to NRM practitioners. While this research has employed many of those variables, further research is needed to explore the relationships between COIC and other variables (e.g. the ‘chain’ of VBN items ‘attached’ to a single land management practice), which could be accomplished with structural equation modelling.

Finally, further research exploring the relevance of all seven CIC dimensions and the refinement of survey items consistent with Ashmore et al.’s (2004) proposed operationalisation to explore the nature and role of occupational amongst rural landholders, including the influence of gender on farmer identity is needed. The role of a farmer occupational identity will increasingly become more important and warrants further investigation as multifunctional rural transition occurs to a greater extent in predominately agricultural areas.


Madden, B., & Hayes, G. (2000). *National investment in rural landscapes: An investment scenario for NFF and ACF with the assistance of LWRRDC*. Albury, NSW.


## Appendix A - NVivo Nodes used for coding and the corresponding definitions

<table>
<thead>
<tr>
<th>Deductive coding nodes</th>
<th>Definition of when to code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-categorization</strong></td>
<td></td>
</tr>
<tr>
<td>Goodness of fit_perceived similarity_protypicality</td>
<td>A person's subjective assessment of the degree to which he or she is a prototypical member of the farmer group.</td>
</tr>
<tr>
<td>Perceived certainty of self-identification</td>
<td>The degree of certainty with which a person categorizes self in terms of a farmer.</td>
</tr>
<tr>
<td>Placing self in social category</td>
<td>Categorizing self in terms of farmer.</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td></td>
</tr>
<tr>
<td>Private Regard</td>
<td>Favourability judgments made by people about their own identities as a farmer.</td>
</tr>
<tr>
<td>Public Regard</td>
<td>Favourability judgments that one perceives others, such as the general public, to hold about one's social category (i.e. farmers).</td>
</tr>
<tr>
<td><strong>Attachment &amp; sense of interdependence</strong></td>
<td></td>
</tr>
<tr>
<td>Attachment_affective commitment</td>
<td>A sense of emotional involvement with or affiliative orientation toward the farmer group. Statements referring to emotional connection with farming organizations or the farmer group. Feelings of a common bond with or ties to the farmer group or belief of a strong sense of belonging or attachment to the group. Statements suggesting how strongly a person feels accepted, valued, respected and supported by the group of farmers.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Interconnection of self and others</td>
<td>The degree to which people merge their sense of self and the farmer group; statements that refer to farmer group membership at any level; references to where interviewees may take farmer group pride or insults personally.</td>
</tr>
<tr>
<td>Interdependence_mutual fate</td>
<td>Perception of the commonalities in the way farmers are treated as a group and not an individual in society. Individuals are aware that they are treated as a group member rather than an individual, that their fates and outcomes are similar despite individual differences.</td>
</tr>
<tr>
<td>Behavioural involvement</td>
<td>The degree to which the person engages in actions that directly implicate the farmer collective identity category.</td>
</tr>
<tr>
<td>Importance</td>
<td></td>
</tr>
<tr>
<td>Explicit importance</td>
<td>The individual's subjective appraisal of the degree to which a collective identity (farming) is important to her or his overall sense of self.</td>
</tr>
<tr>
<td>Implicit importance</td>
<td>The placement of a particular group membership (farming), from low to high, in the person's hierarchically organized self-system; the individual is not necessarily consciously aware of the hierarchical position of his or her collective identities. This node applies when there is referencing to ranking of farming in relation to different groups.</td>
</tr>
<tr>
<td>Content and meaning</td>
<td></td>
</tr>
<tr>
<td>Ideology</td>
<td>Beliefs about the farmer groups experience, history, and position in society.</td>
</tr>
</tbody>
</table>
| Collective identity story (narrative)        | The individual's mentally represented narrative of self as a member of the farming
<table>
<thead>
<tr>
<th><strong>Group story (narrative)</strong></th>
<th>The individual's mentally represented narrative of the farmer group which he or she is a member.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-attributed characteristics</strong></td>
<td>The extent to which traits and dispositions that are associated with farmers are endorsed as self-descriptive by a member of that category.</td>
</tr>
<tr>
<td><strong>Social Embeddedness</strong></td>
<td>Degree to which a farmer is implicated in the person's everyday ongoing social relationships. Reference to one's social contacts and relationships that reinforce a particular identity (farming).</td>
</tr>
</tbody>
</table>

**Inductive coding nodes:**

<table>
<thead>
<tr>
<th><strong>Age</strong></th>
<th>Respondent’s age.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change in self-reflection</strong></td>
<td>Passages related to changes respondents have observed in themselves over time.</td>
</tr>
<tr>
<td><strong>Connection with the land</strong></td>
<td>Perceived connection with the land obtained through historical significance or time on a particular piece of property.</td>
</tr>
<tr>
<td><strong>Direct comparison between US and AU farmers</strong></td>
<td>Explicit comparison between US and AU farmers/landholders.</td>
</tr>
<tr>
<td><strong>Farm succession</strong></td>
<td>Passages related to farm succession.</td>
</tr>
<tr>
<td><strong>Group memberships</strong></td>
<td>Membership affiliation – both farming and non-farming related.</td>
</tr>
<tr>
<td><strong>Hierarchy</strong></td>
<td>Perceived hierarchy of various types of landholders.</td>
</tr>
<tr>
<td><strong>Historical influences</strong></td>
<td>Experience with ‘outdated’ farming techniques and the choice to either reform or continue the currently employed farming practices.</td>
</tr>
<tr>
<td>Income</td>
<td>Percentage of income earned on and off property activities.</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Information source</td>
<td>Where respondents obtain information regarding land management practices.</td>
</tr>
<tr>
<td>Occupation</td>
<td>Current and past occupations.</td>
</tr>
<tr>
<td>Occupational influences</td>
<td>How their past/current occupations influence their land management practices.</td>
</tr>
<tr>
<td>Property size</td>
<td>Amount of land owned.</td>
</tr>
<tr>
<td>Role of farming or farmer</td>
<td>Passages related to the role that farming and farmers have in their lives and in general.</td>
</tr>
<tr>
<td>Time on and off property</td>
<td>Amount of time spent on and off the property.</td>
</tr>
<tr>
<td>Water</td>
<td>Passages related to water.</td>
</tr>
</tbody>
</table>
Land and water management: North Central Victoria

This survey is a vital part of efforts to understand the important social and economic factors shaping landholder decision making. Information you provide will guide the implementation of the North Central Catchment Management Authority’s (CMA’s) 2013-2019 Regional Catchment Strategy that supports landholders working to establish viable futures in the North Central CMA region.

There is no other way to obtain this property level information.

We recognize that you may not be involved in decision making for this property. We are seeking the views of the persons primarily responsible for managing the property. If you are not involved in the management of the property please forward the survey to the property manager or return the survey to Charles Sturt University in the stamped return envelope. We ask that you only provide information for property/s within the North Central CMA region.

Surveys have been sent to a random selection of landholders covering large and small properties. It should take approximately 40 minutes to complete. There are no right or wrong answers and there is no need to think at great length about your responses. If you have any questions about the survey, please phone Allan Curtis at the University on 1800 605 187 or by email at acurtis@csu.edu.au.

You are assured of complete confidentiality. Your name will never be placed on the survey or used in any of the reports. No group outside Charles Sturt University will have access to the survey data. Information is published at the regional scale and individual information is never published.

Thank you for your assistance.

Professor Allan Curtis
Long-term plans for your property

Please indicate the possibility that your long-term plans for your property in the next 10 years will involve each of the choices in the table below. [Examine the response options underneath this paragraph. For each choice in the table, place the number of your response option in the 'View' column].

RESPONSE OPTIONS:

<table>
<thead>
<tr>
<th>Highly unlikely</th>
<th>Unlikely</th>
<th>Unsure</th>
<th>Likely</th>
<th>Highly likely</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Likelihood your long-term plans will involve

<table>
<thead>
<tr>
<th>Ownership of the property will stay within the family</th>
</tr>
</thead>
<tbody>
<tr>
<td>The property will be sold</td>
</tr>
<tr>
<td>The property will be subdivided and a large part of the property sold</td>
</tr>
<tr>
<td>I will live on the property for as long as possible post age 65</td>
</tr>
<tr>
<td>I will move off property around/soon after reaching age 65</td>
</tr>
<tr>
<td>All or most of the property will be leased or share farmed</td>
</tr>
<tr>
<td>Additional land will be purchased</td>
</tr>
<tr>
<td>Additional land will be leased or share farmed</td>
</tr>
<tr>
<td>The enterprise mix will be changed to diversify income sources</td>
</tr>
<tr>
<td>The enterprise mix will be changed to more intensive enterprises</td>
</tr>
<tr>
<td>I will seek additional off-property work</td>
</tr>
<tr>
<td>Some part of the property will be placed under a conservation covenant</td>
</tr>
</tbody>
</table>

Do you have family members interested in taking on your property in the future? [Please tick your answer]

☑ Yes  ☐ No  ☐ Unsure/Too early to know

If YES:
Has your family agreed to a succession plan? [Please circle your answer]

<table>
<thead>
<tr>
<th>Not Started</th>
<th>Early Stages</th>
<th>Halfway</th>
<th>Well Advanced</th>
<th>Completed/Ongoing</th>
</tr>
</thead>
</table>
Your assessment of issues

This set of statements seeks your opinion about the importance of a range of issues that may be affecting your property and your local district. [Examine each statement in the table, then place the number of your response option in each space provided for your 'view'].

**RESPONSE OPTIONS:**

<table>
<thead>
<tr>
<th>Not important</th>
<th>Minimal importance</th>
<th>Some importance</th>
<th>Important</th>
<th>Very important</th>
<th>Not applicable/don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

**Importance of issues affecting your local district**

<table>
<thead>
<tr>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence of important services and infrastructure (e.g. health, schools, internet, mobile phone coverage)</td>
</tr>
<tr>
<td>The impact of pest plants and animals on native plants and animals</td>
</tr>
<tr>
<td>Loss of native plants and animals in the landscape</td>
</tr>
<tr>
<td>Nutrient run-off from rural properties affecting water quality</td>
</tr>
<tr>
<td>Stock damage to native vegetation along waterways and in wetlands</td>
</tr>
<tr>
<td>Impact of ground water use on the extent native plants survive drought</td>
</tr>
<tr>
<td>The effect of ground water extraction on stream flows during drought</td>
</tr>
<tr>
<td>Negative impacts of climate change in this region in my lifetime</td>
</tr>
<tr>
<td>Dams on rural properties reducing run-off to natural waterways</td>
</tr>
<tr>
<td>Long-term negative impacts of property purchased by 'lifestylers'</td>
</tr>
<tr>
<td>Reconfiguration of the irrigation system as part of water reform</td>
</tr>
<tr>
<td>Crop weed resistance to herbicide</td>
</tr>
<tr>
<td>Long-term negative impacts of property purchased by absentee owners</td>
</tr>
</tbody>
</table>

**Importance of issues affecting your property**

<table>
<thead>
<tr>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil erosion</td>
</tr>
<tr>
<td>Low permeability of sub soil</td>
</tr>
<tr>
<td>Declining nutrient status of soils</td>
</tr>
<tr>
<td>Soil acidity (lower pH) undermining productive capacity of soils</td>
</tr>
<tr>
<td>Uncertain/low returns limiting capacity to invest in my property</td>
</tr>
<tr>
<td>Dryland salinity undermining long-term productive capacity</td>
</tr>
<tr>
<td>Irrigation salinity undermining long-term productive capacity</td>
</tr>
</tbody>
</table>
Why your property is important to you

The next set of statements seeks information about the reasons your property is important to you. [Examine each statement in the table and place the number for your response in each space provided for your 'View'.]

RESPONSE OPTIONS:

<table>
<thead>
<tr>
<th>Not important</th>
<th>Minimal importance</th>
<th>Some importance</th>
<th>Important</th>
<th>Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Why your property is important to you</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity to learn new things</td>
<td></td>
</tr>
<tr>
<td>A place for recreation</td>
<td></td>
</tr>
<tr>
<td>Working on the property is a welcome break from my normal occupation</td>
<td></td>
</tr>
<tr>
<td>An asset that will fund my retirement</td>
<td></td>
</tr>
<tr>
<td>A great place to raise a family</td>
<td></td>
</tr>
<tr>
<td>Sense of accomplishment from producing food and fibre for others</td>
<td></td>
</tr>
<tr>
<td>Ability to pass on a healthier environment for future generations</td>
<td></td>
</tr>
<tr>
<td>Sense of accomplishment from building/maintaining a viable business</td>
<td></td>
</tr>
<tr>
<td>A place where I can escape the pressures of life</td>
<td></td>
</tr>
<tr>
<td>Native vegetation provides habitat for birds and animals</td>
<td></td>
</tr>
<tr>
<td>An attractive place/area to live</td>
<td></td>
</tr>
<tr>
<td>The productive value of the soil on my property</td>
<td></td>
</tr>
<tr>
<td>Native vegetation makes the property an attractive place to live</td>
<td></td>
</tr>
</tbody>
</table>

The next set of statements seeks information about the principles that guide your life. [Examine each statement in the table and place the number for your response in each space provided for your 'View'.]

The principles that guide your life

<table>
<thead>
<tr>
<th>The principles that guide your life</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looking after my family and their needs</td>
<td></td>
</tr>
<tr>
<td>Working for the welfare of others</td>
<td></td>
</tr>
<tr>
<td>Protecting the environment and preserving nature</td>
<td></td>
</tr>
<tr>
<td>Being influential and having an impact on other people and events</td>
<td></td>
</tr>
<tr>
<td>Fostering equal opportunities for all community members</td>
<td></td>
</tr>
<tr>
<td>Preventing pollution and protecting natural resources</td>
<td></td>
</tr>
<tr>
<td>Having power and being able to lead others</td>
<td></td>
</tr>
<tr>
<td>Respecting the earth and living in harmony with other species</td>
<td></td>
</tr>
<tr>
<td>Caring for the weak and correcting social injustice</td>
<td></td>
</tr>
<tr>
<td>Creating wealth and striving for a financially profitable business</td>
<td></td>
</tr>
</tbody>
</table>
Your views

In this section we would like to know how closely the statements presented below reflect your views. [Examine each statement in the table and place the number for your response in each space provided for your View].

RESPONSE OPTIONS:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Unsure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable/don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Statements about your views

- If landholders are informed in advance, it would be acceptable to cause minor floods for environmental purposes
- Soil testing is an essential first step in understanding soil condition
- Clearing native vegetation since European settlement has substantially reduced the extent and variety of native vegetation in this district
- If we are careful it is possible to pump ground water without affecting the integrity (water quality and level) of the aquifer
- The benefits of stubble retention outweigh problems arising from the practice
- The costs of applying lime to address soil acidity are justified by increased production
- The costs of establishing perennial pasture are justified by the returns
- The cost of willow removal is justified by improvements in the condition of river banks & river health
- Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking
- Fencing to manage stock access is an essential part of the work required to protect the health of waterways and wetlands
- Improvements in bank stability and vegetation condition justify the costs of watering stock off-stream
- I feel a personal responsibility to be part of a soil health group
- I feel a personal responsibility to maintain my soil's productive capacity
- My local community expects landholders will use stubble management practices that prevent soil erosion
- It is fair that the wider community asks landholders to manage their land in ways that will not cause foreseeable harm to the environment
- The ground water management plan for this area shares water fairly
- The increased allocation of water for the environment under the Murray Darling Basin Plan will improve the health of waterways & wetlands
- The productivity of farm land is related to the health of nearby waterways & wetlands
- Landholders should have the right to harvest water that falls on their property, even if that action impacts on others
- Aboriginal people should have the right to negotiate access with individual landholders to visit important cultural sites
- Rural landholders should have the right to discharge water from their property, even if that action impacts on others
Preferred sources of information

In the past 12 months what have been your sources of information about natural resource management for the North Central catchment? (Please tick yes or no for each information source in the 'Yes/no' column)

<table>
<thead>
<tr>
<th>Source of information</th>
<th>Yes/no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television</td>
<td></td>
</tr>
<tr>
<td>Books/magazines/journals</td>
<td></td>
</tr>
<tr>
<td>North Central Catchment Management Authority</td>
<td></td>
</tr>
<tr>
<td>Victorian Farmers Federation</td>
<td></td>
</tr>
<tr>
<td>Bureau of Meteorology</td>
<td></td>
</tr>
<tr>
<td>Government agencies/departments</td>
<td></td>
</tr>
<tr>
<td>Newspapers</td>
<td></td>
</tr>
<tr>
<td>Field days</td>
<td></td>
</tr>
<tr>
<td>Landscape group/network/coordinator</td>
<td></td>
</tr>
<tr>
<td>Social media (twitter/facebook)</td>
<td></td>
</tr>
<tr>
<td>Local Council</td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
</tr>
<tr>
<td>Agricultural consultants</td>
<td></td>
</tr>
<tr>
<td>Extension officers</td>
<td></td>
</tr>
<tr>
<td>Environmental organisations</td>
<td></td>
</tr>
<tr>
<td>Commodity groups</td>
<td></td>
</tr>
<tr>
<td>Friends/neighbours/family</td>
<td></td>
</tr>
<tr>
<td>Mailed brochures/leaflets/community newsletters</td>
<td></td>
</tr>
<tr>
<td>Other - please list</td>
<td></td>
</tr>
</tbody>
</table>
Occupational identity

This topic explores the extent you see yourself as a farmer by occupation. We realise some people have multiple occupational identities and we ask you to provide that information later. Many respondents are likely to be part-time or non-farmers, and it is important that those people also complete this section. [Examine each statement in the table and place the number for your response in each space provided for your 'View'. Please provide a response for all statements]

RESPONSE OPTIONS:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Statements

**I very much identify with agricultural producers in my district**

**In general, I'm glad that I'm an agricultural producer**

**In general, others respect agricultural producers**

**Being a part of the larger group of agricultural producers is an important reflection of who I am**

**What happens to agricultural producers as a whole will have an effect on what happens in my life**

**I have a strong sense of belonging or attachment to other agricultural producers**

**When someone criticises agricultural producers, it feels like a personal insult**

**My regular social contacts and relationships are with other agricultural producers**

**My agricultural production activities distinguish me from those who are not agricultural producers**

**I consider myself to be a typical agricultural producer in this area**

**The economic position of agricultural producers has worsened a lot over time**

**The social position of agricultural producers has improved a lot over time**

**In a typical day, I very seldom think about being a part of the larger group of agricultural producers**

Please circle the descriptor/term that best describes your occupational identity:

- Full-time farmer
- Part-time farmer
- Non-farmer

For the month of February 2014, estimate the proportion of people you met socially (for example, the people you went with or engaged with at an event, such as at a dinner, sporting event, family function, movies) who you consider are either full-time or part-time farmers:

................................%
Your knowledge of different topics

In this section we would like you to provide an assessment of your knowledge for a number of different topics. [Examine the response options. For each choice in the table, place the number of your response in the 'View' column].

**RESPONSE OPTIONS:**

<table>
<thead>
<tr>
<th>No knowledge</th>
<th>Very little knowledge</th>
<th>Some knowledge</th>
<th>Sound knowledge (sufficient to act)</th>
<th>Very sound knowledge (can give a detailed explanation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Your knowledge of different topics**

- Preparing a farm/property plan allocating land use according to land class
- Which Aboriginal group is connected to the area where your property is
- The role of understorey plants in maintaining native birds
- The role of snags & river-side vegetation in supporting native fish
- The role of ground water in sustaining native vegetation during droughts
- Strategies to maintain ground cover to minimise erosion in this area
- How to establish introduced perennial pastures (e.g. lucerne) in this area
- The ability to identify acidic soils in this area
- The processes leading to soil structure decline in this area
- The role of soil carbon in maintaining soil health
- The extent of native vegetation cover in the North Central region before European settlement
- How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off
- Frequency & rate of lime application to address soil acidity in this area
- Frequency & rate of fertiliser application to maintain productivity across the main soil types on your property
- Frequency & rate of spraying to implement minimum tillage in this area
- The effect of fertiliser application on the persistence of native grasses in this area

**View**
Risk and trust

In this section we would like to explore your views on managing waterways and wetlands and the role of the North Central CMA. [For each choice in the table, place the number of your response in the 'View' column].

RESPONSE OPTIONS:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable/don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Your views

<table>
<thead>
<tr>
<th>View</th>
<th>Negative impacts of cropping/grazing waterways &amp; wetlands can be fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Only a few people benefit from cropping/grazing waterways &amp; wetlands</td>
</tr>
<tr>
<td></td>
<td>Damage to waterways &amp; wetlands from stock/cropping is already obvious</td>
</tr>
<tr>
<td></td>
<td>You can’t be too careful when dealing with people</td>
</tr>
<tr>
<td></td>
<td>People are almost always interested only in their own welfare</td>
</tr>
<tr>
<td></td>
<td>One has to be alert or someone is likely to take advantage of you</td>
</tr>
<tr>
<td></td>
<td>Human activities are influencing changes in climate</td>
</tr>
<tr>
<td></td>
<td>It is not too late to take action to address climate change</td>
</tr>
<tr>
<td></td>
<td>If we do nothing, climate change will have dire consequences for all living things, including humans</td>
</tr>
<tr>
<td></td>
<td>I prefer to avoid risks</td>
</tr>
<tr>
<td></td>
<td>I really dislike not knowing what is going to happen</td>
</tr>
<tr>
<td></td>
<td>I usually view risks as a challenge to embrace</td>
</tr>
</tbody>
</table>

Are you aware of the existence of the North Central CMA?  
☐ Yes  ☐ No

If yes, please answer the next items. If no, please move to the next page.

Your views

<table>
<thead>
<tr>
<th>View</th>
<th>The North Central CMA keeps landholders’ interests in mind when making decisions about waterways and wetlands management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sound principles guide North Central CMA decisions about waterways &amp; wetlands management</td>
</tr>
<tr>
<td></td>
<td>The North Central CMA is very knowledgeable about waterways &amp; wetlands management</td>
</tr>
<tr>
<td></td>
<td>I can rely on the North Central CMA to provide useful advice about waterways &amp; wetlands management</td>
</tr>
<tr>
<td></td>
<td>I can rely on the North Central CMA to provide appropriate financial assistance for waterways &amp; wetlands management</td>
</tr>
</tbody>
</table>
### Enterprise / Land use mix

<table>
<thead>
<tr>
<th>Background Information</th>
<th>Please tick or fill in your response</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the total area of rural land you own within the NCCMA? (excluding land you manage but do not own)</td>
<td>_______ total ha owned</td>
</tr>
<tr>
<td>Is this property your principal place of residence?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>What area of additional land do you manage (lease/share, farm, agist from others) within the NCCMA (additional to the figure you provided above)?</td>
<td>_______ additional ha managed</td>
</tr>
<tr>
<td>What is the longest period of time you have owned or managed all/some part of your property?</td>
<td>_______ yrs</td>
</tr>
<tr>
<td>What area of your property is leased, share farmed or agisted by others?</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>How many rural properties do you own? (including those within and outside of the NCCMA)?</td>
<td>_______ number of properties</td>
</tr>
<tr>
<td>How many of these properties are within the NCCMA?</td>
<td>_______ number of properties</td>
</tr>
</tbody>
</table>

This question is seeking information about your property/ies and current land use/enterprise mix within the North Central region. [Please indicate yes/no, number or area in the ‘Situation Now’ column]. For the following questions we ask that you answer with both the land you own and manage within the NCCMA region in mind.

<table>
<thead>
<tr>
<th>Enterprises / Land use on your property in 2014</th>
<th>Situation Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropping</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>Pasture</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>Dairying (maximum number of cows milked)</td>
<td>_______ Max number</td>
</tr>
<tr>
<td>Total number of beef cattle (cows, calves, steers and bulls)</td>
<td>_______ Max number</td>
</tr>
<tr>
<td>Total number of ewes, lambs, wethers and rams</td>
<td>_______ Max number</td>
</tr>
<tr>
<td>Other commercial livestock enterprises (e.g. goats, pigs, deer, horse studs, poultry, alpacas, dogs)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Viticulture</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Horticulture</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Total area irrigated (in 2013)</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>Remnant native vegetation (e.g. trees, grasslands, wetlands)</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>Farm forestry</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Other tree planting (e.g. shelter, habitat, erosion or recharge control, carbon)</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>Farm-based tourism (e.g. farm stays)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Conservation covenant</td>
<td>_______ Ha</td>
</tr>
<tr>
<td>Area set aside for living/recreation (e.g. gardens, pets, water bodies, vehicles)</td>
<td>_______ Ha</td>
</tr>
</tbody>
</table>
Management practices on your property

This section asks about practices undertaken on your main or 'home' property in the North Central region during the full period of your management; the last 5 years; and the last 12 months. If you have owned/managed your property for less than 12 months, please complete each section. We also want to know if work listed has been supported by government (e.g. North Central CMA, DEPI, Greening Australia, Trust for Nature, Landcare). [Please write a response or tick your response in all spaces even if it is a not applicable (n/a) or zero - an estimate is all that is needed.] For the following questions we ask that you answer with both the land you own and manage within the NCCMA region in mind.

<table>
<thead>
<tr>
<th>Practices over the full period of your management</th>
<th>Response</th>
<th>Gov support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of trees and shrubs planted (incl. direct seeding)</td>
<td>Ha</td>
<td>Yes No</td>
</tr>
<tr>
<td>Area of native bush/grasslands fenced to manage stock access</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Fenced sooks and springs to manage stock access</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Established off-stream watering points</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Fenced waterways &amp; wetlands to manage stock access</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Permanent grassed waterways in drainage lines</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Area sown to perennial pasture and lucerne</td>
<td>Ha</td>
<td>Yes No</td>
</tr>
<tr>
<td>Area with at least one lime application</td>
<td>Ha</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

| Established an irrigation tailwater reuse system | Yes No | NA |

<table>
<thead>
<tr>
<th>Practices over the last 5 years</th>
<th>Response</th>
<th>Gov support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested soils for nutrient status in paddocks where have applied fertiliser/soil conditioners in the past</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Prepared a nutrient budget for all/most of the farm</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Max area of crop or grass sown in any year using minimum or no tillage techniques</td>
<td>Ha</td>
<td>Yes No</td>
</tr>
<tr>
<td>Area where soil ameliorants applied</td>
<td>type Ha</td>
<td>Yes No</td>
</tr>
<tr>
<td>Prepared a habitat assessment for native plants</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practices over the last 12 months</th>
<th>Response</th>
<th>Gov support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated time spent by you or others to control pest animals and non crop weeds</td>
<td>Days</td>
<td>Yes No</td>
</tr>
<tr>
<td>Used time controlled or rotational grazing</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>Used precision farming techniques for cropping</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
</tbody>
</table>
Your property

These questions seek information about you and your main or 'home' property. Questions cover a number of factors that often influence decision-making. We recognise that several people may be involved in decision making and have helped complete the survey. For the following questions we ask that you answer with both the land you own and manage within the NCCMA region in mind.

<table>
<thead>
<tr>
<th>Background Information</th>
<th>Please tick or fill in your response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has this enterprise bought additional land to increase a landholding in this region in the past 20 years?</td>
<td>☐ Yes ☐ No If yes: _______ Ha</td>
</tr>
<tr>
<td>Have you subdivided or sold part of your existing property in this region in the past 20 years?</td>
<td>☐ Yes ☐ No If yes: _______ Ha</td>
</tr>
<tr>
<td>Is another family member working full time on your property? If yes, please indicate who it is (e.g. daughter)</td>
<td>☐ Yes ☐ No If yes: _______</td>
</tr>
<tr>
<td>Are you male or female?</td>
<td>Male  Female</td>
</tr>
<tr>
<td>What is your age?</td>
<td>_______ years</td>
</tr>
<tr>
<td>What is your main occupation? (e.g. farmer, teacher, accountant, investor, retiree)</td>
<td></td>
</tr>
<tr>
<td>In the past 5 years have you completed a short course relevant to property management? (e.g. financial planning, integrated pest management)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Estimate the average number of hours per week that you worked on farming/property related activities over the past 12 months.</td>
<td>_______ hrs/week</td>
</tr>
<tr>
<td>Estimate the number of days that you were involved in paid off-property work in the past 12 months</td>
<td>_______ days</td>
</tr>
<tr>
<td>Did you attend field days/farm walks/demonstrations focused on soil health in the past 12 months?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Did you attend field days/farm walks/demonstrations focused on native plants &amp; animals in the past 12 months?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Are you a member or involved with a local Landcare group?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Are you a member or involved with a local commodity group? (e.g. Flockcare, Cropcare, Best Wool)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Are you a member or involved with a local soil health group?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Have you undertaken a soil salinity survey in the past 5 years?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Have you prepared/are you preparing a property management or whole farm plan that involves a map or other documents that address the existing property situation and include future management and development plans?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Did you irrigate in 2013?</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>If yes:</td>
<td></td>
</tr>
<tr>
<td>How much surface water was used</td>
<td>If yes: _______ ML</td>
</tr>
<tr>
<td>How much ground water was used</td>
<td>If yes: _______ ML</td>
</tr>
</tbody>
</table>
Imagine meeting someone informally for the first time. What two pieces of information would you share with them about yourself?

We appreciate that many people are reluctant to divulge information about their incomes. However, some information about household income is important for this research. For example, changes in profitability and income affect the capacity of landholders to invest in infrastructure and undertake conservation work. Your name will never be linked to your answers and information provided will never be available to any person outside this research team.

Did your property return a net profit (income from your property exceeded all paid expenses before tax) last financial year (2012/2013)?

☐ Yes  ☐ No

If YES: Please indicate the approximate figure for the profit (before tax) from your property last financial year (2012/2013). [Please tick one box beside the appropriate dollar range]

<table>
<thead>
<tr>
<th>Profit</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $20,000</td>
<td>$101,000 to $120,000</td>
</tr>
<tr>
<td>$21,000 to $40,000</td>
<td>$121,000 to $140,000</td>
</tr>
<tr>
<td>$41,000 to $60,000</td>
<td>$141,000 to $160,000</td>
</tr>
<tr>
<td>$61,000 to $80,000</td>
<td>$161,000 to $180,000</td>
</tr>
<tr>
<td>$81,000 to $100,000</td>
<td>Above $180,000</td>
</tr>
</tbody>
</table>

Did you or your spouse receive a net off-property income (after expenses and before tax) last financial year (2012/2013)?

☐ Yes  ☐ No

If YES:
Indicate an approximate figure for the total off-property income (before tax) for you and your spouse last financial year (2012/2013). [Please tick one box beside the appropriate dollar range]

<table>
<thead>
<tr>
<th>Profit</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $20,000</td>
<td>$101,000 to $120,000</td>
</tr>
<tr>
<td>$21,000 to $40,000</td>
<td>$121,000 to $140,000</td>
</tr>
<tr>
<td>$41,000 to $60,000</td>
<td>$141,000 to $160,000</td>
</tr>
<tr>
<td>$61,000 to $80,000</td>
<td>$161,000 to $180,000</td>
</tr>
<tr>
<td>$81,000 to $100,000</td>
<td>Above $180,000</td>
</tr>
</tbody>
</table>
Other comments and thank you for your time

Do you have any other comments about any of the topics covered in the survey, or other aspects of land and water management in the North Central CMA region? Please use the space provided to write your comments or attach additional sheets. Your comments will be recorded by the CSU research team.

We appreciate the time you have spent answering the survey questions. Please return the completed survey in the stamped envelope provided.

If you need assistance with the survey or wish to make specific comments about it, please use the toll free number 1800 605 187 to contact a member of the research team at Charles Sturt University.