



Australian Government

**Rural Industries Research and
Development Corporation**

Small Landholders

***An assessment of potential biosecurity
and land management risks***

by Carole Hollier, Michael Reid and Elizabeth Curran

November 2008

RIRDC Publication No 08/186
RIRDC Project No DAV-228A (PRJ-000623)

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ISBN 1 74151 775 3
ISSN 1440-6845

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Electronically published by RIRDC in November 2008

Foreword

Investigations into small lifestyle landholders and biosecurity issues suggest land uses and management practices of small lifestyle landholders in peri-urban areas pose risks to Australia's biosecurity in terms of agriculture and international trade. This may be linked to low agricultural and natural resource management knowledge of the sector and a general lack of awareness and understanding of biosecurity.

Many small lifestyle landholders are perceived to be also engaged in alternative or unconventional agricultural practices. Currently there is a lack of clarity about the number of small landholders including small lifestyle landholders in peri-urban Australia and their contribution to agriculture. These peri-urban areas have been described as a dynamic rural urban confluence interacting to create a complex community with distinct characteristics that cater for the needs of a diverse range of people within different economic, environmental and social functions. Biosecurity awareness and educational programs mainly target commercial farmers although interest in developing programs specifically for the small lifestyle sector is increasing. Small landholders from cultural and linguistically different backgrounds also provide challenges for traditional extension and biosecurity communication approaches.

This report has addressed some of the gaps in knowledge about small lifestyle landholders and biosecurity. An assessment of the potential risks posed by these landholders has been made. The study found low awareness of biosecurity of small lifestyle landholders and understanding of responsible land management was a major factor of biosecurity risk. The findings of this project will be used to design coordinated approaches to understanding and community risks to small lifestyle landholders in peri-urban Australia. This research will also assist future policy and extension work in this area. However, further research is necessary to build on these findings to begin to understand the extent and magnitude of biosecurity risk at the national scale associated with small lifestyle properties.

This report, an addition to RIRDC's diverse range of over 1800 research publications, forms part of our Food Integrity and Biosecurity R&D program, which aims to deliver research and development to enable Australia to maintain its ability to deal with the threats that pest, disease and bio-terrorism pose to food, to crops, to livestock and to enable access to national and international markets.

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Peter O'Brien

Managing Director

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Acknowledgments

We would like to thank all the interview participants who kindly gave their time and shared their insights with us. We would also like to thank our colleague for their support and assistance during the project especially Nancye Gannaway, Peter Howden, Ruth McGowan, Neil Guise and Howard Conkey.

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Executive Summary

What the report is about

This report explores some factors that may influence biosecurity risk to Australian commercial agriculture associated with small lifestyle landholders; their location, characteristics, land use and management practices. The report addresses some of the gaps in knowledge about small lifestyle landholders and biosecurity. An assessment of the potential risks posed by these kinds of landholders has been made. Small lifestyle landholders are an important segment of the rural population in many parts of Australia. The traditional boundaries and distinctions between rural and urban Australia have become increasingly blurred.

Background

There is a widespread general perception that the increasing numbers of small lifestyle landholders within rural communities and the peri-urban fringe pose risks to Australian animal and plant biosecurity, but the nature and magnitude of such risks is unclear. Australia's reputation as a domestic supplier and exporter of high quality, clean agricultural produce depends largely on its freedom from exotic pests and diseases. Biosecurity risks could have serious environmental and economic consequences. Small lifestyle landholders are distinctly different to mainstream commercial farmers. Many are new entrants to farming and land management and don't have a broad range of practical and technical agricultural knowledge. As such, small lifestyle landholders are often poorly connected to mainstream industry and agricultural networks because they don't see themselves as farmers or rely on agricultural production as the main source of income. They keep diverse varieties of animals and plants for a range of personal and professional interests. Some conduct minimum or no commercial farming activities and others operate small niche agricultural based business ventures. Current biosecurity plans and communication efforts are not well targeted to the small lifestyle landholder segment.

Who is the report targeted at?

This report is targeted at future policy makers and extension professionals. Agricultural landscapes are diverging, with more regions characterised by less dependence upon agricultural production. Currently, demand for landscape amenity is a major influence upon the pattern of structural change in Australian agriculture. The influence is apparent in the high price of land beyond its agricultural value in the more amenable and accessible parts of the rural landscape and peri-urban fringes. A new social characteristic of rural dwellers is typified as amenity and small lifestyle landholders. Increasingly the boundary between rural and urban amenity is becoming blurred in more multiple-function landscapes. Small lifestyle landholders share pockets of land and a wide range of agricultural pursuits within a traditional farming mix.

Biosecurity is a general description of a set of measures designed to protect Australians and individual farming properties from the entry and spread of unwanted animals, pests, diseases and weeds. Biosecurity standards play a crucial role in protecting agricultural industries and retaining market access and market competitiveness. It is a relatively new and holistic concept that tends to be perceived differently by different groups. Awareness and educational campaigns are generally targeted at commercial producers but small lifestyle landholders, one of the fastest growing trends in agriculture, are becoming more important. It is widely recognised that effective biosecurity strategies and actions are a shared responsibility involving all landholders, governments, industry organisations and the general community.

Small lifestyle landholders are distinctly different to their full time commercial farming counterparts. Whether biosecurity risks are greater than or different from, those associated with traditional farmers is unknown.

Biosecurity awareness and the small lifestyle landholder sector is complex. This may be due to the diversity of the social and demographic characteristics of this group of landholders, their high mobility, land use and disconnect from traditional extension programs and industry networks. Land manager awareness and perception of biosecurity risks will influence land management practice.

Aims/objectives

The overarching aim of this study was to heighten the awareness of the small lifestyle landholder profile as a potential risk to Australia's biosecurity, agriculture and market access. Specifically, the objectives of this research were to:

- Build on previous typologies of small lifestyle landholders in rural landscapes to assist in assessment of biosecurity risk associated with these kinds of landholders.
- Profile the location of small lifestyle landholders to identify potential 'hot spots' by linking spatial data to risk analysis.
- Provide knowledge about small lifestyle landholder land use practice and biosecurity awareness to influence communication and skill development programs.
- Assist government to identify and develop strategies and policies to reduce the likelihood of a biosecurity threat attributed to the small lifestyle landholder sector.

Policy makers, industry organisations and government agencies who have a role in biosecurity management and communicating biosecurity messages are the beneficiaries from the research. This study will guide coordinated approaches to understanding and communicating biosecurity risks to small lifestyle landholders. At a broader level, the findings of this research may be used to drive future policy and education/awareness work in this area.

Methods used

This project used an exploratory, qualitative approach to generate data using semi-structured interviews with a range of stakeholders and small lifestyle landholders. Quantitative techniques including questionnaire survey and mapping were also used to help construct the study.

Results/key findings

Small lifestyle landholder can be potential allies or create potential threats to natural resource management, biosecurity and welfare practices. The project highlights the diversity within the small lifestyle landholder segment in their characteristics, land-use and land management practice. Biosecurity awareness and knowledge to recognise, anticipate and manage pests and diseases is generally low. Findings suggest biosecurity awareness is not on the small lifestyle landholder radar. However, the segment is enthusiastic to learn and motivated to seek advice. Knowledge about land management and the connection to potential biosecurity risk to mainstream agriculture is tenuous. The potential risk posed by small lifestyle landholders to biosecurity is amplified by a wide range of social factors. Overall, low awareness levels suggest these kinds of landholders are a biosecurity risk group. Sourcing animals from a range of places, reliance on other small landholders for advice, sharing equipment and animals as well as trading stock through unregulated markets were identified as key risk factors. However the magnitude of the risk and whether small lifestyle landholders pose greater biosecurity risk than other segments of the landholder population is unclear.

Implications for relevant stakeholders

Policy makers and industry groups with an interest in biosecurity need to recognise that small lifestyle landholders are integral members of the agricultural community. Their land use and management is often a socio-cultural practice rather than a technical productivity activity. Awareness and educational

strategies need to appeal to their values and interests because agricultural productivity is not their driving force. All small lifestyle landholders participate in some level of agricultural activity in their own unique way and it will be important not to stigmatise these kinds of landholders.

Recommendations

This project recommends:

- A national quantitative survey of small lifestyle landholders be undertaken to assess the magnitude of biosecurity risk associated with this rapidly growing sector to inform biosecurity efforts within Australia.
- Biosecurity awareness and capacity building programs be developed for small lifestyle landholders through their networks that focus on recognition, anticipation and management skills of pest and disease biosecurity risk including human health.
- A national coordinated program to improve the availability and accessibility of biosecurity information and advice is developed for small lifestyle landholders.
- Industry based biosecurity plans actively target small lifestyle landholders in a way that will appeal to their characteristics and values.
- The principles of good biosecurity practice are embedded into formal whole farm planning processes and checklists in order to raise awareness levels and influence property management decisions.
- Further research is conducted to assess biosecurity risk associated with the movement of animals and produce in unregulated markets and non compliance issues.

1. Introduction

The possibility of an outbreak of an exotic disease in plants and animals and the spread of unwanted pests, diseases and weeds currently in Australia is a constant concern for agriculture and the environment. It is a common perception that small lifestyle landholders contribute to biosecurity threats to mainstream livestock and plant production in Australia. Generally, these biosecurity risks have been associated with spreading existing pests and disease, and with poor pasture, land management of animal husbandry practices. Concerns about small lifestyle landholder biosecurity risk have been expressed because these kinds of landholders lack experience on the land and were not part of networks through which they could become aware and learn how to improve their practices. Just what these biosecurity threats might be, and their magnitude and significance to Australia's agricultural production systems and international trade have not been well defined.

For the future productivity and competitiveness of Australian agriculture, it may be critical to develop approaches to improve understanding the small landholder segment to communicate biosecurity risks as a means of generating better on-farm biosecurity practices. This report highlights the location of small landholdings in particular regions of Australia as potential biosecurity 'hot spots'. It explores the perceptions of professionals working in extension and biosecurity programs towards small lifestyle landholders and small lifestyle landholders' awareness of biosecurity. Improved understanding of the potential biosecurity risks associated with small landholders will inform future biosecurity communication and extension programs to minimise risk associated with these kinds of landholders.

Background

Small rural landholders motivated by lifestyle choice are becoming an increasingly significant component of farming communities around the fringes of Australia's major cities, rural urban centres and amenable regional locations. This has resulted in the emergence of a new kind of rural landscape, where traditional agricultural production systems in some areas are now part of a complex mix of land uses that reflect many different economic, environmental and social functions. In comparison to mainstream commercial farmers on large or small properties, these landholders are distinctively different in their characteristics, values, attitudes and land management practices. While they may live on rural properties, land use activities are not solely productivity driven and often reflect urban values. Farming is usually not their primary occupation, background or main income source.

There is a widespread perception that many small lifestyle landholders lack land management knowledge and experience and may be unaware of biosecurity risks related to their practices (Aslin and Mazur 2005; Hollier and Reid, 2007). The sector has been acknowledged as diverse and potential allies or potential threats to good natural resource management, biosecurity and animal welfare practices (Alsin 2004; Hollier and Reid 2007). Previous research suggests small lifestyle landholders contribute to biosecurity risks associated with the spread of existing pests and weeds, poor pasture, land management or animal husbandry practices. As such, their diverse land uses and management practices are a potential risk to Australia's biosecurity, agriculture and market access.

Small rural lifestyle landholders are becoming increasingly recognised as an important segment of the rural population in many parts of Australia. The Department of Primary Industries in Victoria has developed a special program to improve small lifestyle landholders' awareness and understanding of their land management and animal welfare responsibilities. More than 54,000 small landholders are targeted in this program. The Victorian program is modelled on the successful Department of Agriculture and Food, Western Australia, Small Farm Information Service targeting more than 60,000 small landholders. Both programs are underpinned by extension activities to build the capacity of small landholders to understand their land management responsibilities and host a range of topic specific and property management introductory workshops to new landholders. Other state agencies

have expressed strong interest in developing similar programs to work with the increasing number of small landholders to reduce perceived biosecurity risk.

There is some evidence that traditional commercial farmers are more likely to be connected to established networks and to maintain good biosecurity standards (Barclay 2005; Aslin et al. 2004). On the other hand, small lifestyle landholders have been reported to be marginalised in agricultural industry networks and productivity focused extension activities (Hollier and Reid 2007) and as such may miss out on valuable biosecurity capacity development information. There is a general belief that the technical agricultural and land management expertise of the small lifestyle landholder is likely to be low. Many small landholders are 'new' to farming. Furthermore, the idea of owning a small farm or 'patch' of bush is appealing to more and more people, many of whom may have little interest in agriculture.

Project description

This study focuses on small lifestyle landholders as a possible biosecurity risk group. This project has a national focus and was specifically concerned with identifying small lifestyle landholder awareness and understanding of biosecurity and their current land use practices that may increase biosecurity risk. The project builds on previous studies that have reported the greater complexity and heterogeneity in rural land occupancy associated with small property ownership and explored the spatial location and characteristics of small landholders (Barr 2003; Barr et al. 2005; Aslin et al. 2004, Hollier and Reid 2007). Peri-urban or rural lifestyle landholders have been identified as a potential biosecurity risk group, and concerns have been expressed about whether existing biosecurity information and awareness campaigns are reaching this segment of the rural population (Aslin et al. 2004; Hollier et al. 2004).

Biosecurity is a relatively new concept and term that is constantly evolving. Interpretation, scope and focus vary among organisations, programs and specialist groups. It is a general description for a set of measures designed to protect animals and produce from unwanted pests and disease. Biosecurity standards play a crucial role in protecting agricultural industries and retaining market access and market competitiveness. Irrespective of whether landholders manage large rural properties, small-scale commercial operations or lifestyle rural allotments that focus on niche markets or hobby interests, all these landholders are part of Australia's agricultural industry. Understanding small lifestyle landholder awareness of biosecurity and potential risks associated with their current land use practice will enable appropriate communication and capacity building programs to be developed.

Research rationale

The nature and extent of small lifestyle properties present challenges for biosecurity communication and risk assessment. Their land use practices and level of awareness and understanding of biosecurity are uncertain. The sector also appears to be diverse, mobile and increasing in numbers. It includes segments that may be difficult to contact such as absentee, second and holiday home owners and people who actively avoid involvement with government (Aslin et al. 2005). Relatively little is known about the small lifestyle landholders within the context of biosecurity risk.

Although Australia is recognised as taking a comprehensive approach to tackling biosecurity (Nairn 2001; Meyerson and Reaser 2002), there is a call to undertake a more multi-disciplinary approach to effectively deal with biosecurity in the Australian context (Murray and Koob 2004). There are few studies on farmers and biosecurity awareness, and fewer still that focus on small landholders and biosecurity. The issue of biosecurity within small lifestyle landholder regions is a relatively new research topic. Nevertheless, the social context of biosecurity awareness and management has not been well addressed. Rather, the majority of research undertaken tends to focus on particular animal or plant pests or diseases (biological characteristics, risk assessment, control methods), or in some cases, on issues for particular industry sectors or ecosystems and is location specific (Aslin and Mazur 2005). It

is a common perception that small lifestyle landholders pose risks to mainstream agriculture. But just what these threats might be, and their magnitude and significance are unclear.

Due to a lack of baseline information and the complexity of biosecurity and the small lifestyle landholder sector, an exploratory, qualitative research approach was used. Improved understanding of the human component of biosecurity will assist in future biosecurity program delivery, targeting of risk areas and tailoring of messages. Previous social based small landholder research (Aslin et al. 2004; Aslin and Mazur 2005; Maller et al. 2007, Hollier et al. 2007) has focused mainly on ‘case expert’ perceptions of the sector. This study is distinctive because its primary focus was on gathering information from the ‘first-order actor’, those who reside on smaller rural allotments. The theoretical understandings have been informed by previous research undertaken by the authors in addition to revision of current biosecurity literature.

Objectives

The overarching objective of this study was to heighten the awareness of the small lifestyle landholder profile as a potential risk to Australia’s biosecurity, agriculture and market access. Specifically, the objectives of this research were to:

- Build on previous typologies of small landholders in rural landscapes to assist in assessment of biosecurity risk associated with these kinds of landholders.
- Profile the location of small landholders to identify potential ‘hot spots’ by linking spatial data to risk analysis.
- Provide knowledge about small landholder land use practice and biosecurity awareness to influence communication and skill development programs.
- Assist government to identify and develop strategies and policies to reduce the likelihood of a biosecurity threat attributed to the small landholder sector.

These objectives were underpinned by the need to foster a stronger linkage with government agencies with an interest in socio-demographic change in rural communities and potential biosecurity risks. It is envisaged that this study will be used to assist in the development of coordinated approaches to communicate biosecurity risks to small landholders and their cohorts to build capacity for responsible land and livestock management. The study has established inter-agency linkages with the Product Integrity, Animal and Plant Division of the Australian Government Department of Agriculture, Fisheries and Forestry, Plant Health and Animal Health Australia. Preliminary investigations were presented at the Primary Industries Health Committee Peri-urban Biosecurity Workshop, Canberra 2006. A key component of the study in its initial phase was to bring state and federal biosecurity and extension practitioner experts together at a National Forum to guide the direction of the study and establish a sustained network of authorities with an interest in this issue. A National Forum was convened in Melbourne in June 2006 to guide the project direction.

Furthermore, the findings of this study will assist in guiding future biosecurity communication and extension activities within state agencies and the National Small Landholders Extension Practitioners Network established in April 2008. Specifically this project:

- provides insights into the practices of small landholders and makes an assessment of the biosecurity risk posed by this emergent client group
- suggests ways to work more effectively with the sector to build capacity and develop rural property plans and activities aligned to best practice biosecurity
- identifies research gaps to be addressed by future work in this area.

Terminology

Small farms and lifestyle landholders

Small farms have always been a part of the Australian agricultural landscape (Barr and Karunaratne 2001). Over the past decade a new subset has emerged often described as ‘small lifestyle landholders’. This group of landholders share catchments with commercial farming operations and inhabit environmentally aesthetic rural landscapes that have been characterised as neither urban nor rural, but a dynamic interface and transitional zone with a diverse range of land uses (Buxton et al. 2006; Land and Water 2007). The small lifestyle landholder phenomenon has moved well beyond major urban centres exerting peri-urban influences on surrounding rural lands. In contrast to fully commercial small farm enterprises, these landholders purchase rural property primarily for lifestyle reasons in amenable landscapes (Aslin 2007; Hollier et al. 2006). Landuse activities may include small scale orchards, market gardens or vineyards; or running a small number of farm animals including sheep, cattle, pigs, goats, alpacas, recreational horses or poultry. Landuse activities tend to focus on hobby or recreational interests, subsistence/home consumption, or small-scale niche market commercial opportunities. Farm animals are often kept as pets. In recent years, the term ‘tree changers’ has emerged to describe those people who are leaving major cities or regional centres in search of bush blocks and rural lifestyle properties generally close to population centres and infrastructure (Salt 2004, Aslin 2007). These kinds of people owning small rural properties have also been categorised as ‘peri-urban’ dwellers and ‘rural residential’ landholders (Houston 2005; Aslin et al. 2004). Inevitably whatever the motivation or aspiration for small acreage ownership, these people commonly describe their land as ‘the farm’.

Currently, there is no clear definition of what constitutes a small lifestyle landholder. Much discussion has focused on the growing number of these kinds of landholders, but definitions and terminology varies across different studies and within different groups of people (Aslin 2005; Barr et al. 2005; Hollier & Reid 2007). Classifications are based on minimum land size, perceived motivations for land ownership, farm income, and land use activity or whether the landowners are categorised as primary producers. For this study small lifestyle landholders were defined as small property owners with:

- area between 2 to 100 hectares
- low estimated value of agricultural operation
- significant off-farm income source(s)
- rural lifestyle property as a primary or secondary residence (absentee landholder).

Currently, demand for landscape amenity exerts pressure and influence upon the pattern of structural change in Australian agriculture (Barr et al. 2005). Changes in the Australian farm sector demography are the result of a number of pressures, many of which are of market origin. Hence, it would be simplistic to view demographic outcomes in too narrow a context when the impacts of technology, markets, lifestyle changes and economic developments are only some of the emerging and established drivers of these changes. Nevertheless, aggregated statistics concerning Australian farming hide increasing diversification of the small rural landholder sector.

Biosecurity

Biosecurity risk is a major concern for primary industries, agricultural production and agricultural trade. The threat of a wide range of new animal and plant pests and diseases becoming established and compromising agricultural production and exports in Australia is widely recognised. Landholder awareness of possible threats, coupled with the cooperation to modify their practices and implement control measures are critical if a new pest or disease outbreak was detected. The outbreak of an exotic disease in plants or animals has potentially devastating impacts, not only on agriculture, but also for natural resources, public health, trade and economic growth (Murdoch et al. 2006; Stoneham et al.

2005). The main tools of biosecurity can be described as exclusion, eradication and control, supported by expert system management, practical protocols and the rapid and efficient securing and sharing of information.

Meyerson and Reaser (2002) warns against just viewing biosecurity as a buzz word, rather to view it as the vital work of strategy, efforts, and planning to protect human, animal, and environmental health against biological threats. Biosecurity is a relatively new concept and a term that is constantly evolving. Usage, emphasis and scope vary among organisations, programs, and specialist groups. There are many definitions of biosecurity, each with different scope and emphasis but all include pests and diseases, both plant and animal.

Food and Agriculture Organisation (United Nations)

Biosecurity is a strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) that analyse and manage risks in the sectors of food safety, animal life and health, and plant life and health, including associated environmental risks. Biosecurity covers the introduction of pest plants, animal pests and diseases, and zoonoses, the introduction and release of genetically modified organisms and their products, and the introduction and management of invasive alien species and genotypes. Biosecurity is a holistic concept of direct relevance to the sustainability of agriculture, food safety, and the protection of the environment, including biodiversity.

Australian Biosecurity Co-operative Research Centre

“The protection of people, animals and ecological systems against disease and other biological threats. Biosecurity is achieved through systems that aim to protect public health, animal and plant industries, and the environment, from the entry, establishment and spread of unwanted pests and diseases”.

Biosecurity in the context of this study was defined as: ‘a set of measures designed to protect people, farms, animals and plants and ecological systems from the entry, establishment and spread of unwanted pests, diseases and weeds.’ The study focused on biosecurity perceptions and land use practice of the small lifestyle sector (weed management, animal husbandry) and pests and diseases most likely to have a significant economic impact on mainstream agriculture. A risk assessment approach was used to identify the high-risk elements within the sector.

Current biosecurity situation

Australia remains free of many animal and plant diseases that pose problems to agriculture in other nations. Retaining our ‘clean green’ image is important to Australian agriculture’s future. Recent overseas epidemics of foot-and-mouth disease (FMD) and avian influenza demonstrate the growing importance of vigilance for governments for the containment of pests and diseases. The Department of Agriculture, Fisheries and Forestry (DAFF) is the Australian Government department responsible for maintaining and improving international trade and market access opportunities for agriculture, fisheries, forestry and food industries. Biosecurity Australia (an independent agency within DAFF) provides science-based quarantine assessments and policy advice to protect Australia from exotic pests and diseases. Administrative authority for national quarantine is vested in the Australian Quarantine and Inspection Services (AQIS). State and territory governments play critical supporting roles in biosecurity communication and management.

One of the greatest risks of spreading pests and diseases between properties is livestock or plant material, people, machinery and equipment movement from farm to farm and from region to region. All landowners have a responsibility to ensure biosecurity risks are minimised. In this way the probability of an incursion or outbreak may be reduced. Landholder awareness of biosecurity risks also increases the probability of early detection if issues arise and reduces potential costs to

government, industry and the community. Early detection is universally recognised as one of the most important elements in terms of a nation's capacity to minimise and control the impact of exotic pests and animal disease (Conkey et al. 2004).

In testing Australia's preparedness to tackle an exotic disease outbreak, simulation exercises Mintotaur 2002 (FMD) and Eleusis 2005 (avian influenza) were conducted to evaluate the industry and government's national capacity to manage a zoonotic disease outbreak. More recently, Australia experienced a real major exotic disease outbreak – equine influenza. This disease outbreak highlighted the challenges associated with locating and communicating with small lifestyle landholders, some of which included:

- a lack of understanding amongst horse owners about biosecurity, and having no biosecurity measures in place
- remote location of some horse owners and general lack of knowledge about the contagious nature of the disease
- a lot of people who owned horses were not registered or connected to a horse club or industry association

The relative freedom from pests and diseases of Australian agricultural industries and the environment is of great importance for maintaining levels of international trade and the natural environments. Australia is facing new biosecurity challenges - increased risks from invasive species, increasing rates of new and re-emerging diseases, land use change and heightened concerns around food safety. Globalisation can be attributed to facilitating greater movement of humans, domestic animals, wildlife populations and agricultural products through international travel and trade.

There is a strongly felt sense of urgency from governments to rearrange institutions into new formations to mitigate biological security risks (Collier et al. 2004). Agriculture industry groups across Australia have also invested resources into developing industry based biosecurity plans. With the increasing propensity of global trade and rising consumer expectations it is imperative for Australian agricultural industries to constantly improve biosecurity systems.

Small lifestyle landholders present new opportunities and challenges to agencies with an interest in biosecurity protection. Previous research based on the insights and perceptions of professionals working in extension and biosecurity programs suggests that this group of landholders pose risks (Aslin et al. 2004; Aslin and Mazur 2005).

Structure of the report

The following chapters contain a brief overview of the approach and method (Chapter 2), results of a review of a literature review research on biosecurity and the small lifestyle landholders including gaps in knowledge (Chapter 3), research findings based on mapping the sector and stakeholder perceptions of biosecurity risk (Chapter 4) and research findings from small lifestyle landholder interviews (Chapter 5). The final section provides a conclusion and recommendations.

2. Approach and Methods

This section describes the approach and methods used in this study. The project had these main stages:

- Identification and consultation with key stakeholders to explore perceived biosecurity risks
- Review of literature
- Mapping and preliminary investigation – pilot survey
- Selection of two case study locations to research small lifestyle landholder awareness of biosecurity and land management practices.
- Semi-structured interviews with small landholders (Victoria and Western Australia)
- Data analysis and reporting

The issue of biosecurity risk and small lifestyle landholders is a relatively new research topic. As such, the project primarily adopted an exploratory, qualitative approach to generate information because of a lack of baseline data to explore small lifestyle landholder biosecurity awareness, understanding and land use practices. A number of different methods of collecting data were used: literature and web-based research, document collection, mapping, observation techniques, semi-structured interviews and questionnaire survey. Using multiple methods was designed to provide opportunities to cross check information from different sources and improve the validity of the research.

The key methods and tools used were:

- a National Forum targeting stakeholders and convened by the researchers to workshop current understanding of the sector and perception of risks
- Literature review
- Mapping of the location of the small landholder segment to identify potential biosecurity 'hotspots' based on current data (Australian Bureau of Statistics)
- Collection and analysis of primary data via interviews with stakeholders and small landholders in Victoria and Western Australia. On-farm semi-structured interviews conducted with small lifestyle landholders in two case study areas.

This study had several interconnected components to improve understanding of small lifestyle landholder awareness of biosecurity and current land use practice that may pose potential biosecurity risks. These components included:

- Pilot small landholder questionnaire survey conducted in the peri-urban area of south east Melbourne.
- Questionnaire survey/discussions with small lifestyle landholders at Victoria's major small farm events.

The key research questions to guide the methods selected were:

- What do professionals working in extension and biosecurity programs believe are the potential biosecurity risks associated with small lifestyle landholders?

- Where are small lifestyle landholders mainly located and where are the ‘hotspots’ for potential biosecurity risk?
- What are the land management practices and land uses of small lifestyle landholders?
- What level of awareness and knowledge do small lifestyle landholders have about on-farm biosecurity?
- What are the potential risks posed by small lifestyle landholders to Australia’s biosecurity?

Biosecurity and the small landholder sector is complex. This is because of the diversity of the social and demographic characteristics of the sector and their land uses. Consequently a case study method was selected for the study to explore small landholder awareness of biosecurity and land management practices because of its suitability in dealing with complex and multivariate contexts (Yin 2003). Two different geographic areas known to be under the influence of rapid land use change associated with an expanding number of small lifestyle landholders were selected. These areas were the Swan Valley region, Western Australia, located within 50 km east of Perth and the north east region, Victoria, located within 50 kms east of Albury/Wodonga. Small landholders are the numerically dominant rural landowners in both these peri-urban regions. Interview subjects were selected based on referral from key stakeholders and a snow-balling sampling technique, where existing study subjects were used to recruit more subjects, within each of the pilot study regions. Referrals from key informants were selected to ensure a diversity of social, agricultural production characteristics and varying land sizes within the definition of what constitutes a small lifestyle landholder. Aside from the qualitative component, quantitative data was drawn from existing data bases to construct location maps. Questionnaire surveys were used to further construct the case study. It was anticipated that having two case study regions, within different governance jurisdictions, socio-economic and land use would improve the representativeness of small lifestyle landholders and the validity of the findings.

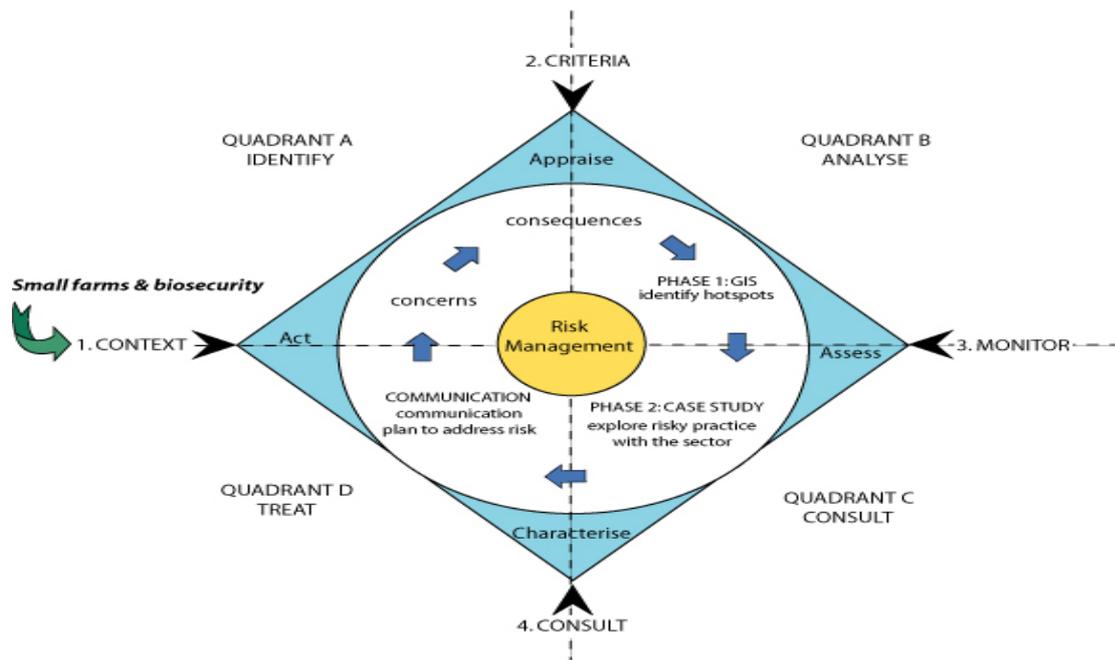
An advisory committee met regularly over the life of the project to provide strategic advice, assist in communicating project activities, provide support to the researchers, and identifying strategic links with other similar projects and programs.

Conceptual risk management framework

A conceptual risk management framework was developed at the outset of the study to inform the research design. Risk, during a given time, is defined by Beer and Ziolkowaki (1995) as the union of a set of consequences and a set of probabilities of the scenarios under consideration. A generic risk management approach was adapted from the Australian Risk Management Framework (1999) to guide the research approach of the project. It was applied to ensure a logical, consistent process and relevancy and uptake of the research for secondary users.

Figure 1 describes the conceptual framework of risk management and the activities that underpinned the project. As part of the framework biosecurity concerns and potential consequences were identified within a small farm context, maps were constructed to identify potential biosecurity ‘hotspots’ based on density of small landholders in agricultural landscapes, and semi-structured interviews and surveys with small lifestyle landholders and key stakeholders were conducted to identify potential ‘risky’ land management practices. In this way, the project was constructed to aid the future development of communication plans, engagement strategies and generic communication tools to build awareness and understanding of biosecurity within the sector.

Figure 1. Conceptual risk management framework (Adapted from the Standards Australia and Standards New Zealand, 1999)



Literature review

A literature review on biosecurity risks associated with small properties was conducted prior to the primary data collection. The review was based on documents sourced via a search of databases (Proquest, Ingenta and CAB Abstracts), Australian government websites, and discussions with biosecurity experts. The purpose of the review was to build understanding of potential biosecurity risks and issues, and to analyse gaps in the current knowledge associated with the emergent small lifestyle landholder landscape.

Mapping spatial location

Small farms are located in particular regions of Australia. Mapping was used as a tool to explore the spatial location of the small lifestyle landholders and to begin to analyse the small landholder sector and biosecurity. The mapping approach was taken because the density of small landholdings in specific regions is likely to be a good indicator for the probability of a major animal or plant disease outbreak due to multiple transmission pathways for the spread of pests and diseases.

Various socio-demographic, economic and biophysical data layers were overlaid and analysed to quantify the main land use practices of the sector and also to broadly identify regions of biosecurity concern or 'hot spots' based on the following criteria:

- Regions with a high percentage of small farmers.
- Regions of high numbers of small farmers from Non-English Speaking Backgrounds (NESB).
- Regions with a high economic agricultural output.
- Regions containing a variety of diverse land uses.

Geographic information system techniques were used to explore some potential regions across Western Australia, South Australia, Victoria, Tasmania, and New South Wales. Estimated Value of Agricultural Operations (EVAO), the aggregation of farm production commodity values, was used as an indicator of the extent of agricultural activity.

Three groups of classifying variables were used in the mapping process to segregate regions that may be of concern, namely socioeconomic and demographic variables. The main indicators used included:

- Local Government Areas (LGA) where there is a high degree of agricultural activity
- LGA with high percentages of small farms
- LGA with high percentages of people involved in agriculture, fisheries and forestry from non NESB.

Data collection – interviews & surveys

Small landholders within two case study areas were selected; North Eastern Victoria and City of Swan, Perth, Western Australia. The case regions were selected as examples of areas where there were substantial numbers of small lifestyle landholders (based on our mapping) to gather information on biosecurity awareness and land management practices. These areas were also selected because they both had government funded extension programs designed specifically to target small lifestyle landholders to improve awareness and understanding of responsible land management. Interviews were semi-structured, conducted face-to-face and mostly held on-farm. The duration of the interviews averaged two hours and included a property tour. Observation data was noted and all interviews recorded and transcribed. Interviewees in the study were purposely chosen within key target areas of the Department of Primary Industry, Victoria, Services and Information to New Landholders Project and the Department of Agriculture and Food, Western Australia, Small Farms Information Service Project. Interviewees were selected by referrals from other small landholders or agency staff working with the sector. Thirty-three small lifestyle landholders were interviewed.

Semi-structured interviews took the form of conversations, where the researchers had a list of issues and questions to be covered; however, the format of the interviews was flexible to allow the conversation to explore a wide range of issues that may emerge during the course of the interview. Semi-structured interviews were selected as the main tool for data collection because they are well suited for the exploration of the perceptions and opinions of respondents regarding complex and sometimes sensitive issues (Foddy 1994; Barriball and While 1994). Semi-structured interviewing can provide a rich description of the social dimensions (i.e. aspirations, relationships with government agencies) and processes that underpin a particular issue or situation (Barriball and While 1994). Interviews were recorded (with the permission of the interviewee), transcribed and reviewed to develop notes.

The interview questions drew on the previous work by Aslin and Mazur (2005) and Hollier and Reid (2007) and were designed to focus on biosecurity awareness and land use practices. A qualitative research method based on grounded theory was used for data collection. This methodology was chosen because it uses a systematic approach to assist in establishing categories and themes to help describe small landholder awareness and perceptions of biosecurity and their land management practices. Semi-structured interviews were selected as the main tool for data collection because they are well suited to the exploration of the perceptions and opinions of respondents regarding complex and sometimes sensitive issues such as managing pests and reporting diseases - and enable probing for more information and clarification of responses (Foddy 1984). At the beginning of the interviews, participants were given a collection statement to sign which ensured confidentiality of the data being collected. However, the researchers recognise that there may still be some level of intrusiveness with participants being sensitive to revealing information to a government department. The majority of questions were open-ended, requiring the respondent to volunteer an answer (see Appendix A). The

interviews began with demographic based questions and then focused on specific topics as identified through the risk assessment.

Semi-structured interviews were also carried out across 15 Local Government Areas in Victoria to gauge perceptions of small landholder biosecurity awareness and land use practices with key stakeholders including local government Environmental Officers and Land Planners, Catchment Management Authority Officers and regional government agency, Natural Resource Management Officers and Industry Development Officers. Fifty-four key stakeholders were interviewed as key informants. The interviewees were purposely chosen as people who had specific roles and knowledge relevant to the study and were considered to be 'case experts'. The questions were designed to elicit data on the interviewees' perceptions of small landholders, their motivations and values and appropriate communication pathways. Other questions were designed to explore biosecurity awareness issues and perceived risks associated with land use practice.

Additionally, questionnaire surveys were conducted with small landholders randomly selected from visitors to the Seymour Alternative Farming Expo in 2008 and the Small Farms Victoria Field Day at Lang Lang in 2007. Using multiple research methods was designed to provide opportunities to cross check information from different sources to improve the validity of the research.

Data analysis

Interview transcripts were analysed using 'NVivo' software and standard content analysis methods (Foddy 1994, Yin 2003), in which responses to each of the questions asked were summarised and the range of views characterised but without attempting to quantify them. Data were initially analysed by question (i.e. grouping all interviewees' responses to each question), followed by a more in-depth content analysis using broad themes and sub-themes that emerged from the interviewees' responses.

3. Literature Review

This review brings together current knowledge about small lifestyle landholders and biosecurity risk. The possibility of an outbreak of an exotic disease in plants and animals and the spread of invasive species and pests is a constant concern for Australian agriculture. There is increasing concern that the small lifestyle landholder sector may pose biosecurity risks to agriculture and future market access (Aslin et al. 2004; Aslin and Mazur 2005; Hollier and Reid 2007). However, the magnitude and significance of the small lifestyle landholder segment to Australian biosecurity have not been well defined. The focus of the review was to build on our understanding of the characteristics of small lifestyle landholders and risk perception.

The small lifestyle landholder landscape

The small lifestyle landholder phenomenon is shaping the rural population in amenable areas and peri-urban landscapes across Australia (Barr 2003; Hollier and Reid 2007). Like the rural landscape itself, those who populate it are diverse and possess a wide range of characteristics. These areas have been described as a dynamic rural urban confluence interacting to create a complex community with distinct characteristics that cater for the needs of a diverse range of people within different economic, environmental and social functions (Ford 1999; Buxton et al. 2006). Lifestyle landholders vary in their values, socio-economic characteristics, drivers and their land use practices (Hugo 2002, Aslin 2006, Hollier and Reid 2007). Most small landholder research has focused on the demographic change in amenable rural areas and peri-urban landscapes, identifying ‘tree changers’, ‘lifestyle landholders’, ‘small farmers’ or ‘hobby farmers’ as important emergent segments within rural communities (Barr and Karunaratne 2001; Houston 2003; Burnley and Murphy 2004; Salt 2004; Synapse and Hudson 2005; Aslin and Mazur 2005; Barr et al. 2005).

There is a general lack of clarity in defining the small landholder sector and who inhabits the amenable rural and peri-urban landscape and the magnitude of biosecurity risks. Also, there is a lack of clarity about the number of small landholders including the small lifestyle landholders segment in peri-urban Australia (Alin et al. 2004; Hollier et al 2007; Maller et al. 2007) and their contribution to agriculture (Houston 2005).

Diversity in land use, attitudes and aspirations appear to be their most striking feature providing challenges for biosecurity awareness and on-farm preventive strategies (Aslin 2006, Hollier and Reid 2007). Many of these kinds of rural landholders share the characteristics that while they may live on rural properties, farming is not their primary occupation or income source (Aslin 2007; Hollier and Reid 2007). As such, this may have implications for biosecurity awareness and preparedness.

Nevertheless, small lifestyle landholders share catchments with small and large commercial farms. They often keep a range of farm animals including pigs, poultry or recreational horses and have diverse land use across the horticultural and livestock industries. Hodges (2005) reported that peri-urban small farmers are likely to produce high value agricultural products including fruits and vegetable, flowers and eggs. Houston (2005) has highlighted the economic importance of agriculture in peri-urban landscapes, the potential economic impacts of biosecurity threats to agriculture in these areas, and the possible costs in terms of lost production associated with other land uses.

Hopper et al. (2002) report that there are over 60,000 small farm operations in Australia occupying 20% of agricultural land managed by semi-commercial farmers. In some local government areas, small landholders are numerically the most significant land managers (Hollier and Reid 2007). Nationally it is very difficult to get estimates of the overall numbers of small lifestyle landholders. This is partly due to the issues associated with defining the sector clearly. It has been estimated that in Victoria and Western Australia more than 100,000 small lifestyle landholders manage small properties in amenable areas close to services (Hollier et al. 2007; Guise et al. 2005). The Bureau of Rural

Sciences (2006) has recently mapped peri-urban Australia using classifications of 'rural residential' segments characterised by agriculture in a peri-urban setting and 'rural-living', where agriculture does not provide the primary source of income using data from the Australian Collaborative Land Use Mapping Program. The expansion of the peri-urban zone beyond traditional zones adjacent to major urban centres is evident. Victoria has the greatest density of small landholdings across the agricultural landscape within these classifications in Australia. As interest in the extent of the small lifestyle landholder builds and more data becomes available, the spatial accuracy in which these properties can be mapped will increase as well as estimates of the number of small lifestyle landholders.

The changing nature of rural landholders and land use has implications for a wide range of government services and responsibilities. In terms of biosecurity, there has been relatively little focus on the significance of increasing numbers of rural landholders who do not rely on agriculture for their income. Most biosecurity research focuses on specific animal or plant pests or diseases such as biological characteristics, risk assessment or control methods, or in particular industry sectors or ecosystems and does not take a primarily social perspective (Aslin and Mazur 2005).

Risks, uncertainty and the changing nature of rural landscapes

Alterations of ecosystems and natural resources contribute to the emergence and spread of infectious disease agents. Human induced land use changes have been identified as a primary driver of a range of infectious disease outbreaks and emergence events and also modifiers of the transmission of endemic infections. Patz et al. (2004) identified these drivers as agricultural encroachment, deforestation, road construction, dam building, irrigation, wetland modification, and mining, the concentration or expansion of urban environments and coastal zone degradation.

It is now widely recognised that many parts of regional Australia is undergoing significant land use change. In Victoria, these regions have been referred to as amenity landscapes (Barr et al. 2005) with the higher amenity values associated with the landscapes being associated with higher rainfall, relatively undisturbed natural woodlands and hilly terrain (Reid et al. 2004). In some areas, large commercial agricultural operations have been fragmented for rural lifestyle living or small scale specialised production systems. This fragmentation of agricultural land increases the population density in landscapes. More dwellings within regions increases population flow inside and outside of the region. In addition to increased population movements, more densely populated landscapes may create new zoonotic pathways as people are coming into closer contact with the landscape, animals, plants and micro-organisms.

Biosecurity awareness and small lifestyle landholders

Current biosecurity information and awareness material is extensive; however these resources are generally not targeted at small lifestyle landholders or peri-urban dwellers (Day 2005). There are few studies (in Australia or internationally) on farmers and biosecurity awareness, and fewer still that focus specifically on small lifestyle landholders and biosecurity. As previously mentioned, government agency professionals working in primary industries and biosecurity generally perceive small lifestyle landholders as potential biosecurity risks. This is partly explained by a widespread belief that some small landholders are poor land managers, have limited animal husbandry skills and are generally disconnected from agricultural industry networks (Aslin et al. 2005; Hollier and Reid 2007). As such, the sector is perceived to have a low awareness of biosecurity.

Although limited, recent research to improve the understanding of the sector to assist extension service delivery and increase awareness of responsible land management reflect the growing interest in biosecurity risk associated with the typology of small lifestyle landholders in peri-urban landscapes (Guise et al. 2005, Ashlin et al. 2004; Aslin and Mazur 2005; Conkey 2004; Maller et al 2007; Hollier and Reid, 2007). Aslin et al. (2004) highlights the importance of the sector for improved targeted biosecurity communication programs to build awareness and suggests a suite of communication

pathways based on the perceptions of professionals with specific roles and knowledge relevant to biosecurity.

Biosecurity awareness and the small lifestyle landholder has been linked to their characteristics including their lack of experience on the land, poor connection to industry networks or lack of interest or motivation to be part of the biosecurity efforts to protect mainstream agriculture (Hollier et al 2004; Aslin and Mazur 2005). Much of the previous research investigating biosecurity risks associated with the growing number of small lifestyle landholders is reliant on second order observers (for example case experts or key informants) to provide an unbiased view of the sector based on their perceptions. However, the sector is generally not engaged in agency based extension and may even distrust and avoid the government services (Collier 1995; Cary 1993; Hollier et al. 2004) which may distort the findings.

As such, a 'one-size fits all' approach to biosecurity awareness and education programs may be inappropriate for engaging with the sector. Aslin et al (2004) suggests that biosecurity communication with the sector needs to appeal to leisure, lifestyle and amenity interests, as well as interests in environment and conservation. Using informal networks and communication channels that support small lifestyle landholder values and interests (that often relate to non-utilitarian value sets) has been reported to be a way to build the awareness and capacity of small lifestyle landholders in understanding their land management responsibilities (Hollier and Reid 2007). Aslin and Mazur (2005) suggest that mobilising these landholders existing value sets and relating biosecurity activities to these values is the best way of motivating the sector towards on-ground action. Parker (2000) stresses the importance of trust, and building personal relationships as a catalyst for community participation in awareness and educational programs. This may provide specific challenges for biosecurity awareness programs with the small lifestyle landholder sector due to high levels of absentee landholdings in some regions or isolation from community networks (Hollier et al. 2004).

Risk management and perception

In Australia there are few studies on farmers and biosecurity awareness, and fewer still that focus specifically on small landholders and the socio-economic aspects of biosecurity risks to mainstream agriculture. The limited studies into small landholders and biosecurity issues (Aslin et al. 2004; Aslin and Mazur 2005; Schembri et al. 2006; Hollier and Reid 2007) suggest land uses and management practices of small landholders in peri-urban areas pose biosecurity risks based on the perceptions of others about landholders.

Schembri et al. (2006) report that pigs provide an excellent example of a species kept by small landholders that potentially pose a risk to Australia's biosecurity. Pigs are highly susceptible to a variety of diseases and the introduction of a foreign disease through the feeding of food wastes (swill) is unique to the species. Her survey research of investigating pigs on small holdings in the Sydney basin highlighted a lack of awareness and knowledge about exotic diseases including identification, understanding of why swill feeding was a biosecurity risk and ineffective pig ownership identification. Lack of awareness amongst small landholders about the risks associated with practices such as operating in unregulated market systems (ie. trading livestock with out appropriate animal identification) and inability to identify potential biosecurity risk is an issue that warrants further investigation.

Framing biosecurity risks from a social perspective and investigating why small landholders do what they do on their properties that may pose biosecurity risks, introduces a more holistic approach to understanding the sector and biosecurity issues to improve communication. Although researching biosecurity from this perspective may be more abstract; results may be more informative to improve policy, awareness and practice change. Policy in itself will not be adequate to lead to efficient and effective biosecurity (Stoneham 2005). Other practice change tools and mechanisms such as educational programs will also play a vital role. Parker (2000) concludes that developing an effective extension strategy to mitigate risk needs to be framed as a social change activity with a focus on

changing the behaviour of landholders. He argues that this approach also ensures that organisations address the relevant policy and systematic issues raised from the research.

Murray and Kobb (2004) highlight the need for the adoption of a more multi-disciplinary approach to risk management for biosecurity in Australian agriculture. Green (2001) suggests there is a need to ensure that biosecurity measures are developed that meet economic and social expectations, and enable cross-sectoral communication with integrated responses to emergencies. Currently, risk management appears to be largely focused on biological aspects of particular risks, taking a single species or single issue approach, and in many cases has an industry focus. Aslin et al (2005) concludes whilst this approach is vital it needs to be complemented by a balancing focus on social and economic aspects of biosecurity. The importance of maintaining a holistic approach to understanding biosecurity systems and the dangers of limiting perspective's away from system frameworks has been previously explored (Collier et al. 2004; Cook and Lonsdale 2006). Jay et al. (2003) believe there is a need to focus on understanding the social and political dimensions of the pathways of biosecurity risks. This can only be partially met by understanding the perceptions of the sector from government and other private agencies. Exploring the experiences small lifestyle landholders and biosecurity provides a more complete picture.

Clarifying the extent of biosecurity risk management and perceptions of risk associated with small landholder land use practice is complex. Psychological and sociological aspects of risk perception have important implications for how small lifestyle landholders may perceive, act upon and react to biosecurity messages. Maller et al (2007) has reviewed risk perception and communication and concludes that in future communication with peri-urban Australians about biosecurity, it is desirable to have:

- Specific long-term local relationships established between agronomists, veterinarians, agricultural extension officers and peri-urban landholders.
- Local forums, venues and networks established for information exchange, social learning and effective dialogue about peri-urban land use.

Credibility and trust

Mistrust of government and other authority figures is a pervasive feature of modern society. In exploring biosecurity issues a re-occurring theme throughout the literature was the lack of trust towards government agencies (Barnes 2002; Botterill and Mazur 2004; Stayner and Barclay 2002). Barnes (2002) states that:

Members of the public are concerned about the safety of the wider environment and their surroundings. At the same time, regulators may be seen to be concerned about helping to provide safe environments. An impasse arises in this mutuality when regulatory expertise loses credibility in the eyes of the public it is meant to protect. Reduced public trust and disbelief of authority can be a result.

Trust plays an important role in knowledge, particularly interpreting what is 'right' or 'wrong'. The subject of credibility and trust can be viewed as essential elements to reducing barriers to adoption and acceptance of advice (Boyd 2003; Caroline and Bell 2003). The decline of trust in public institutions has been attributed to the lack of public trust and confidence in those involved in the control of hazards and regulation of risk, a reputation of institutions for not disclosing key pieces of information, or inefficiencies in the process of communicating with the public (Botterill and Mazur 2004).

This recurrent theme in the literature that trust in authorities plays a role in individual's biosecurity risk management and perceptions may warrant further investigation. Public attitudes to specific risks are influenced by a wide range of cultural, moral, and political, scientific and economic arguments and are significantly influenced by how people feel about an issue. Barnes (2002) has considered risk perception and social meaning, and their relevance to community safety issues. He highlights the

increasing divergence between different groups in society and perceptions of ‘professionalised bureaucracy’ and scientists with formal regulatory responsibility and credibility which can only be bridged by better understanding of how the public makes sense of, and copes with risk and uncertainty. Aslin et al (2005) suggest that some small lifestyle landholders may actively avoid and be suspicious of government and ‘don’t want their names on lists’ because of mistrust in government. This may act as a potential impediment in risk management and perception of biosecurity within the sector particularly with small landholders that have purchased property mainly for a rural retreat and community isolation.

Barclay (2001) investigated the Foot and Mouth Disease (FMD) outbreak in England and highlighted tension and issues of trust between farmers and government organisations. This was embedded in the perceptions of the role of government in a biosecurity outbreak, trust of government agencies in decision making and poor communication processes. Trust issues are also evident within the Australian context. Barclay (2005) surveyed 3,000 livestock producers in Queensland, New South Wales and Victoria and found that government veterinary officers or the emergency disease hotline was unlikely to be contacted in the case of any unusual symptoms in livestock. The majority (70%) was more comfortable in reporting incidents to their local veterinarian. Effective communication of the risk of a biosecurity outbreak will need to take into account these social values that underlie people’s perceptions. For example, Stayner and Barclay (2002) found in their examination of service provision for farmers during the 1996 drought, that local, familiar and trusted agencies within rural communities were the preferred contact for accessing support.

Botterill and Mazur’s (2004) review identified a research shortage in how different farmers’ and rural communities risk perceptions are from the rest of society. Understanding how small farmers perceive biosecurity risks will assist in targeting better policy and more effective means for communication. Innovative risk communication models focus on ‘risk’ as socially constructed; valuing different forms of knowledge; and improving public participation in risk assessment and management (Barnes 2002).

Cultural and linguistic challenges

Small landholders or ‘backyard hobby producers’ from culturally and linguistically diverse backgrounds have been reported to pose specific biosecurity risk management and communication challenges (Conkey 2004; Aslin and Mazur 2005). This may be linked to traditional farmer practices from their country of origin and mix of livestock (poultry, pigs, cattle) on small holdings for personal use.

Parker (2000) reports major gaps within government extension approaches in engaging with small farmers from non-English speaking backgrounds and provides a comprehensive approach towards achieving practice change amongst these landholders in the peri-urban fringe of Sydney through improved understanding of their social characteristics.

Social aspects of biosecurity

Understanding the social aspects of biosecurity risk and management may assist to identify and develop strategies with small lifestyle landholders to reduce the likelihood of a biosecurity threat attributed to the sector. The social implication of an Emergency Animal Disease (EAD) outbreak in Australia has recently been the focus of research exploring the social aspects of biosecurity (Barclay 2005). Social implications from the 2001 FMD outbreak in England were accompanied by distress, feelings of bereavement, fear of a new disaster, loss of trust in authority and systems of control, and the undermining of the value of local knowledge (Mort et al. 2005).

Compliance behaviour is critical component in successful biosecurity strategies. Barclay (2005) surveyed a range of livestock producers to investigate the extent of biosecurity practices on farm, the level of knowledge about exotic animal disease and the perceptions of risk and attitudes towards biosecurity issues. Most of the participants reported that they had implemented some type of on-farm biosecurity strategy. Barclay (2005) found that the predominant farmer attitude towards biosecurity

was that if government agencies do their job properly landholders do not need to be concerned about biosecurity. The greatest risk of an exotic disease outbreak was attributed to neighbours failing to report stock sickness or stock death, followed by feral animals, imported animals and imported semen.

Biosecurity communication and extension approaches

This section discusses the importance of biosecurity education and awareness from an economic perspective and current extension programs targeted at small landholders in Australia. Developing communication and extension approaches targeted at small lifestyle landholders that address their needs will play an important role in the level of biosecurity awareness. Future extension approaches to build understanding of responsible land management within the small lifestyle landholder sector will need to be underpinned by appropriate biosecurity messages and communication pathways.

Biosecurity communication and education play a vital role in protecting Australia's agricultural economy. Agriculture directly contributes \$25 billion of the total output of the economy and employs 375,000 people (Productivity Commission 2005). Agriculture plays a much bigger role in Australia's exports than might be expected given its output share. In 2003-04 it directly accounted for around 22 per cent of Australia's total goods and service exports (Productivity Commission 2005). The economic and social cost of an outbreak of FMD in Australia has been estimated to be over \$9 billion (Productivity Commission 2002). Potential impacts included oversupply of meat to the domestic market, depressed prices and decline in domestic revenue of over \$3 billion. Control and compensation costs were estimated to be \$450 million for a large outbreak, and the cumulative loss to the national economy was forecast to be up to \$13 billion in gross domestic product.

The perceived low agricultural economic significance of small lifestyle landholders may influence national industry approaches to biosecurity extension services. The importance of developing effective cost-sharing procedures in the design of biosecurity systems has been emphasised (Stoneham et al. 2005; Perrings, et al. 2005). Applying biosecurity cost-sharing principles to small lifestyle landholders may be hampered by the lack of quantified data that reflects their contribution to agricultural output. Small holdings in peri-urban regions of Australia have been reported to contribute between 2 to 25% of Australia's total gross agricultural value (Nelson et al. 2004; Houston 2005). Despite lower economic contribution than traditional commercial farming operations, small farms may still be significant contributors to biosecurity issues. For example, Spennemann and Allen (2000) research highlights the biosecurity impact of olives escaping from small hobby farms and becoming a major weed problem in the Adelaide Hills.

Cook and Lonsdale (2006) warn on adopting a pure economic framework to biosecurity when examining such a highly complex problem, which is particularly relevant to regions of high amenity with high populations of small landholders. They state that the non-market good of regions need to be strongly considered, such as an environmental amenity, a rural community or cultural activity. Donaldson et al. (2002) review of FMD in England, from an actor-network perspective, demonstrated that the devastating social consequences of the outbreak are more prolonged than the relatively 'short-term' economic misfortunes. Previous demographic mapping (Hollier and Reid, 2004) highlights the close proximity of regions with a high percentage of small farmers to public lands. Brown (1989) states that there is abundant evidence that invading species have directly caused or indirectly contributed to the extinction of native species and substantially changed the structure and dynamics of both natural and human modified ecosystems.

Recent biosecurity campaigns

Small rural landholders have been the focus of a recent biosecurity awareness campaign developed by the Product Integrity, Animal and Plant Health Division (PIAPH) of the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF). The campaign targets 1.3 million small landholders (Conkey 2004). Information resources focus on raising awareness levels, using bird flu as an introduction, simple measures to reduce pest and disease outbreaks and generalised animal health

and plant health information. The campaign material provides contacts and a dedicated website has been developed.

The establishment of the Primary Industries National Communications Network (NCN) for an animal disease outbreak has been instrumental in developing a communication framework in the possible outbreak of an exotic biosecurity animal disease in Australia (Conkey 2004). This communication networks aims to engage with all landholders, irrespective of property size or land use activity. The NCN employs a three tiered approach, being a National level (DAFF), State level (state government agencies) and local level (local government) and that all tiers are directed at a different audience. For example, a Local Disease Control Centre (Local Government) – target audience is farmers and the community within its area of responsibility, the State Disease Control Headquarters – is responsible for State and Territory wide coordination, whilst the National Disease Coordination Centre – is responsible for Australian Government, national and international coordination.

The other well-established emergency response plan is the AUSVETPLAN. This is a series of technical response plans that describe the proposed approach to an emergency animal disease occurrence. It provides a coordinated national response plan for the eradication of exotic disease and certain emerging or endemic animal disease. It defines the roles of Commonwealth, State and Territory governments and industry in the case of an outbreak (Animal Health Australia 2002). It is an authoritative reference to the control/eradication policies for a particular emergency animal disease. It provides technical information about the nature of the disease, the principles of its control and the control policies. Each strategy provides sufficient information to allow authorities to make informed decisions on what policies and procedures should be used to control an outbreak.

Current education and awareness campaigns of government agencies and industries tend to be targeted at mainstream producers. Generally biosecurity awareness programs are not as well funded as the emergency response. At present, most states and territories do not have long-term biosecurity communication campaigns in place. Cooperative research centres focus on research rather than communication. Industry organisations conduct very few independent biosecurity awareness activities and some state farmer bodies do not conduct any biosecurity communication activities. Current biosecurity communication and extension activities need to be further integrated across the different levels of government. There is a need for more collective action to move beyond pre-occupation with barrier quarantine and more towards raising the awareness of what biosecurity means to every individual in society (Carbon et al. 2002).

Conkey (2004) has reviewed current programs and developed targeted communication campaigns focused on animal, plant and quarantine issues for different kinds of landholders, including small landholders from non-English speaking backgrounds. The campaign features face-to-face communications and attendance at ethnic and cultural festivals to tap into informal and formal networks. Resources have been produced in 10 languages and include brochures, information sheets, websites, displays and posters, an audio-cassette, video and radio program series. The importance of developing appropriate communication and educational material for small lifestyle landholders is becoming increasingly recognised. Parker (2000) confirms this, but further asserts that a new model of extension is needed for working with marginalised small farmers in industrialised economies. He criticises governments simplistic approach towards engagement, 'if they [government] could get a group together they could do something'. It is becoming increasingly apparent that current biosecurity communication and extension activities also need to be further integrated across the different levels of government (Conkey 2004).

Small farm programs

Two state agricultural agencies have recently developed specific problems to target biosecurity messages to the small lifestyle farm sector. The Department of Agriculture and Food, Western Australia, established a Small Landholder Information Service (SLIS) in 2003 that indirectly addresses biosecurity issues through property planning courses and topic specific field days and workshops. The

Department of Primary Industries, Victoria, developed a special program for small lifestyle landholders, Services and Information for New Landholders (SINL), in 2006. Both programs offer land management and animal husbandry information and convene specific events targeted at small landholders to improve their understanding of land management responsibilities. These programs were developed to address concerns as to whether ‘hobby farmers’ had sufficient knowledge and skills to manage what has become an increasing proportion of the landscape. Land degradation, weed management, plant and animal disease and pests, and animal husbandry were identified as particular extension challenges.

Both programs operate where the number and predicted expansion of small landholdings is greatest. The SLIS current focus is on the south-west region of Western Australia whereas the SINL focus area is central, northern and west Gippsland (Victoria) areas. In both States, a small group of Departmental staff oversee, coordinate and support the development of learning events, promotional materials and foster local/regional networks as part of the delivery. Both programs use a range of mechanisms to deliver information and capacity building events. These include providing a one-stop information service, series of information notes; dedicated web page and calendar of events for small landholders. The inaugural National Small Landholders Extension Practitioners Forum was held in Western Australia in April 2008, to promote a unified approach to issues affecting small properties. The forum was organised by the Department of Agriculture and Food Western Australia (DAFWA) and attracted representatives from Federal and State primary industry departments, the Australian Biosecurity Co-operative Research Centre, Animal Health Australia, and the Bureau of Rural Sciences. Representatives from all states reported biosecurity concerns associated with the sector. A major initiative to come out of the forum was the establishment of a National Small Landholder Network to build a collaborative extension approach, share resources and delivery models. This may provide a vehicle to accelerate biosecurity awareness within the sector.

Special programs targeted at small landholders and underpinned by biosecurity concerns compliment the extensive range of government and industry advisory services available to landholders. Most programs are underpinned by biosecurity aspects. Most extension professionals acknowledge a level of concern associated with the small landholder phenomena and the potential impacts of this new emergent client group within farming communities and the broader agricultural industries. However, for many extension workers, engaging with small landholders is a part of their day-to-day service delivery.

Gaps in knowledge

A major gap in knowledge is the level of small lifestyle landholder biosecurity awareness, their perceptions of what constitutes risk and their land use practices. Several recent studies have examined the changing nature of the rural-urban fringe in Australia and the implications for agriculture (Aslin et al. 2004; Bunker 2003; Houston 2005; Buxton et al. 2006). However, current knowledge on the small lifestyle landholder sector tends to be case or location specific, anecdotal or based on expert key stakeholder perceptions. There is a lack of knowledge at the macro level on the number of ‘rural lifestyle landholders’ in peri-urban landscapes and the scale of land use based activities. Although it appears to be a common perception that these kinds of small landholders pose biosecurity risks to mainstream agricultural production in Australia, just what these threats might be, and their magnitude and significance have not been clearly defined. This is further complicated by a lack of clarity in defining the small landholder segment and rural lifestyle landholder sub-set. There is a lack of common language when describing the sector. Key gaps in knowledge can be grouped into the following areas:

- What is the small landholders’ awareness and understanding of biosecurity? Do they connect their land use practices with biosecurity?
- Location and demographics: What is the number, rate of change and socio-economic profile including contribution to the agricultural economy of these kinds of landholders?

- Understanding the relationship between types of small landholders and their potential biosecurity risk – do some landholders pose greater risks than others?
- Ground truthing current thinking on risk perception including stakeholder perceptions of these kinds of rural dwellers.
- How do small landholders source their information about biosecurity? What networks do they belong to?
- Levels of compliance to industry standards, codes and best practice systems (for example, livestock traceability practices such as the National Livestock Identification Scheme, Property Identification Codes and Animal Welfare codes). Where do these kinds of landholders sell or trade their product? What is the level of unregulated market activity?
- What is the economic contribution of the small lifestyle landholder segment to agriculture?

4. Research findings

This section describes the spatial location of small landholdings to explore the research question: Where are small landholders mainly located and where are the ‘hotspots’ for potential biosecurity risks?

Where do small lifestyle landholders live?

As part of this study a series of maps were generated to identify areas with the greatest concentration of small landholdings, the estimated value of agricultural production in these areas and the cultural/linguistic attributes of these areas. Whilst this data provides guidance as to where people of interest might be concentrated, it is clearly very difficult to distinguish between lifestyle properties and small commercial farms on small holdings without directly surveying landholders. These maps provide a guide to small landholder potential ‘hotspots’ that may be useful for biosecurity risk assessment, communication/education program development. The data was used to select the case study areas to interview small landholders of part of this study.

Broadly, the mapping exercise highlights small property concentration along the south-east coast of Australia, extending from around peri-urban areas of Melbourne through to Albury-Wodonga and areas into New South Wales, including regional inland cities and the Southern Highlands. In South Australia concentrations occur south of Adelaide and the peri-urban fringe, especially the Adelaide Hills, whereas in Western Australia the concentration is clearly visible around peri-urban Perth stretching from Northam through to the Margaret River area and countryside around Albany. Peri-urban Hobart and the northern rural districts towards Launceston in Tasmania have the highest concentration of small properties.

Trends in small property location are consistent with previous mapping based primarily on land parcel size (Hugo 2002; Aslin et al 2005; Houston 2005; Hollier and Reid 2007) and highlight the expanding concentration of small holdings close to major urban centres. This movement in peri-urban areas is often unrelated to economic drivers such as employment opportunities or agricultural based business opportunities (Murphy 2005; Hollier and Reid 2007) but was an expression of lifestyle aspirations and changing societal values (Burnley and Murphy 2004, Holmes 2006). The wide range of motivations and aspirations for rural property ownership is reflected in the landholder mix in rural communities. As such, the composition of non-metropolitan Australia is becoming increasingly diverse and it is becoming increasingly more difficult to construct a singular, all encompassing typology of the small landholder sector. This presents challenges to biosecurity risk assessment, approaches to biosecurity awareness campaigns and biosecurity educational programs within this landholder segment.

The following maps are presented in Statistical Local Areas (SLAs) based on the boundaries of incorporated bodies where these exist. These bodies are the local government councils and the geographical areas, which they administer, are known as Local Government Areas (LGAs).

Figure 2. Value of Agricultural Production across Victoria.

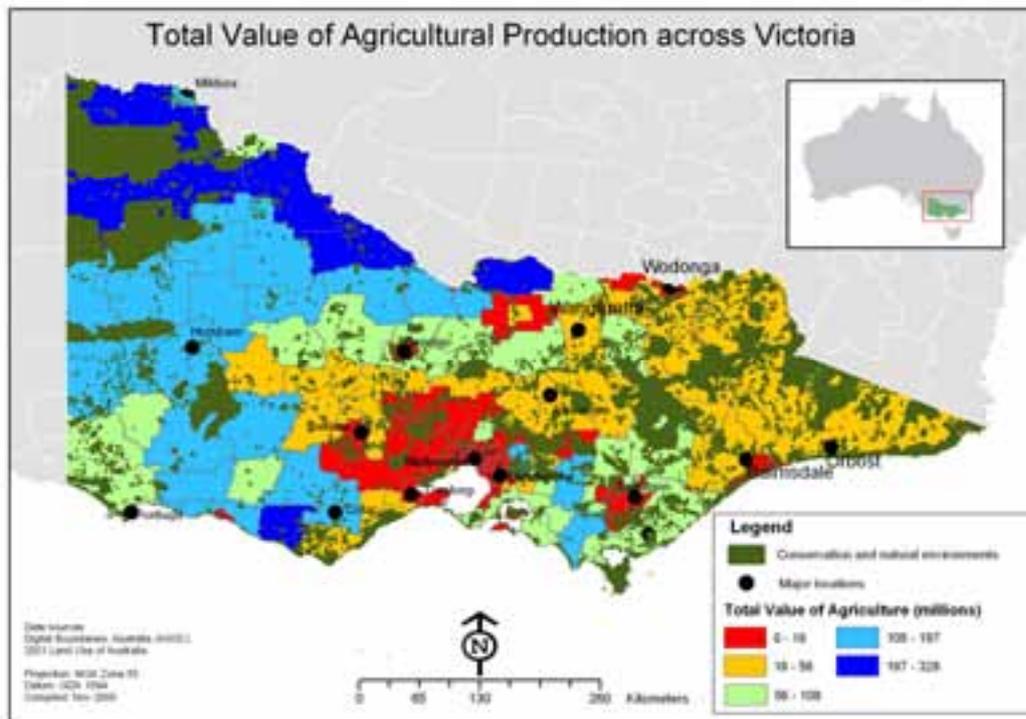


Figure 3. Areas in Victoria with a High Percentage of Small Farms.

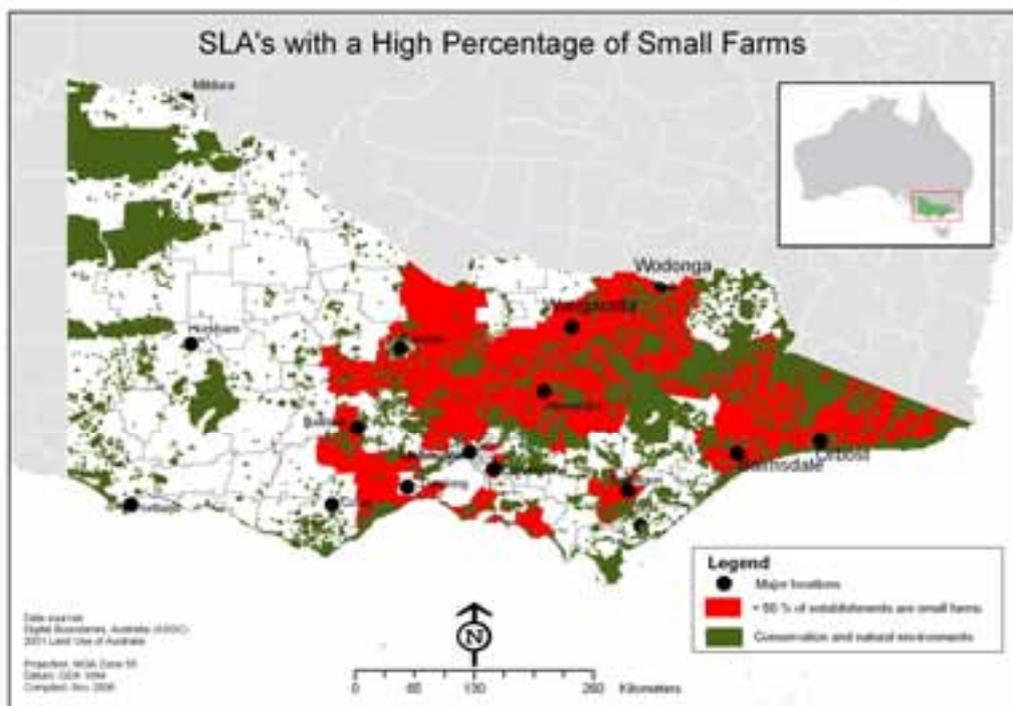


Figure 4. Agriculture, Fisheries and Forestry Employees from NESB.

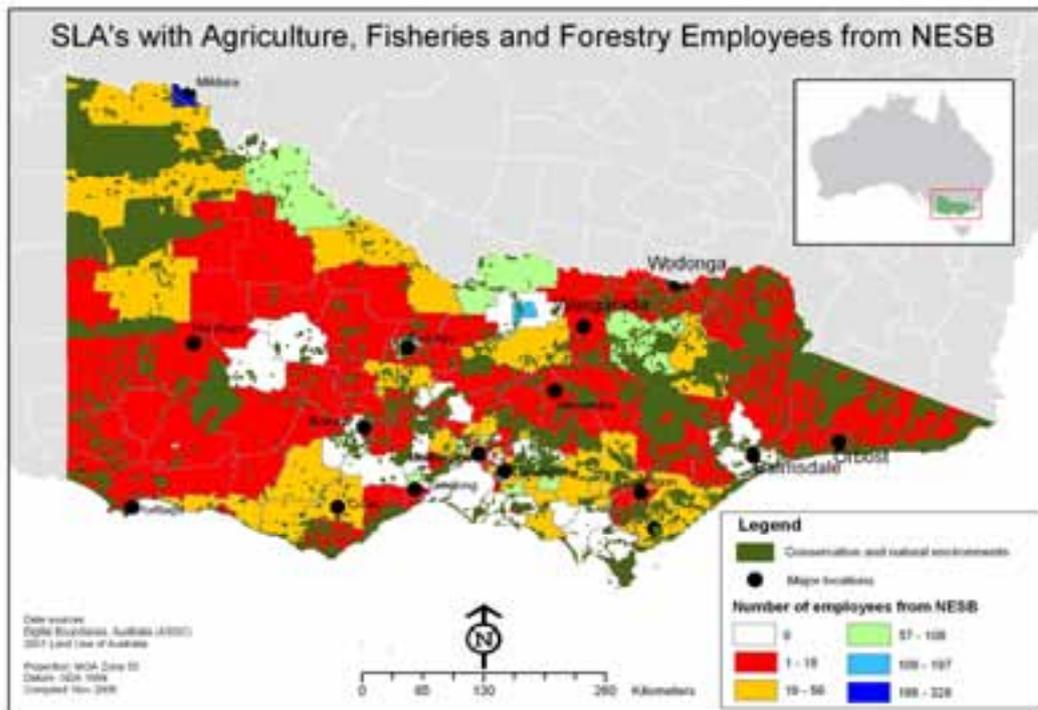


Figure 5. Areas in New South Wales with a High Percentage of Small Farms.

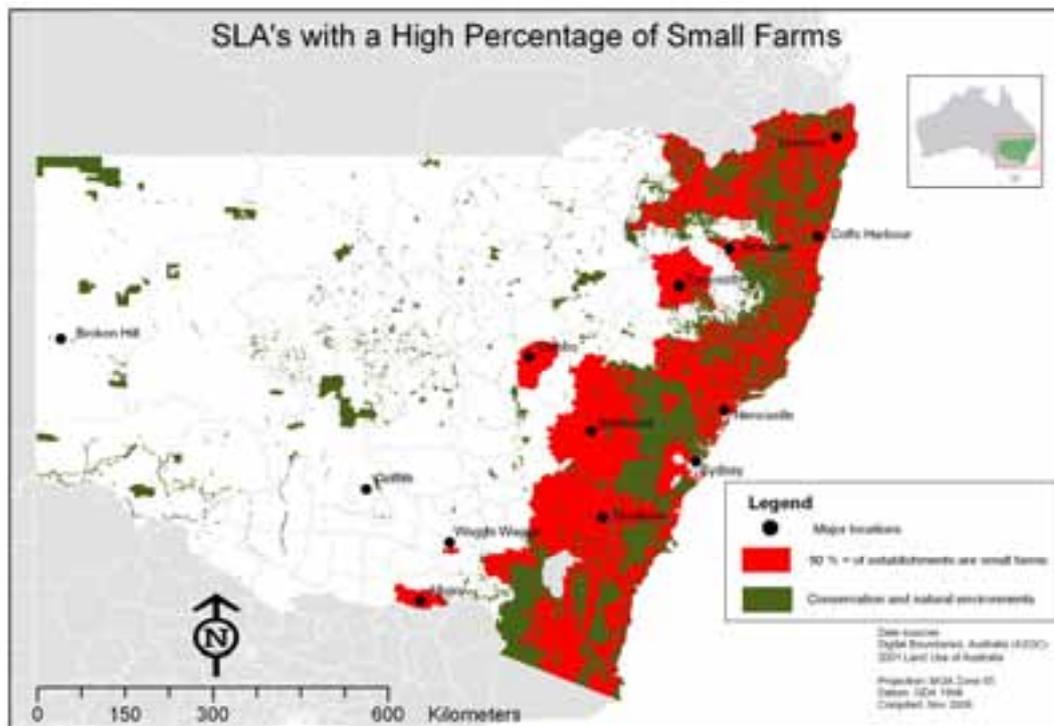


Figure 6. Total Value of Agriculture Production across New South Wales.

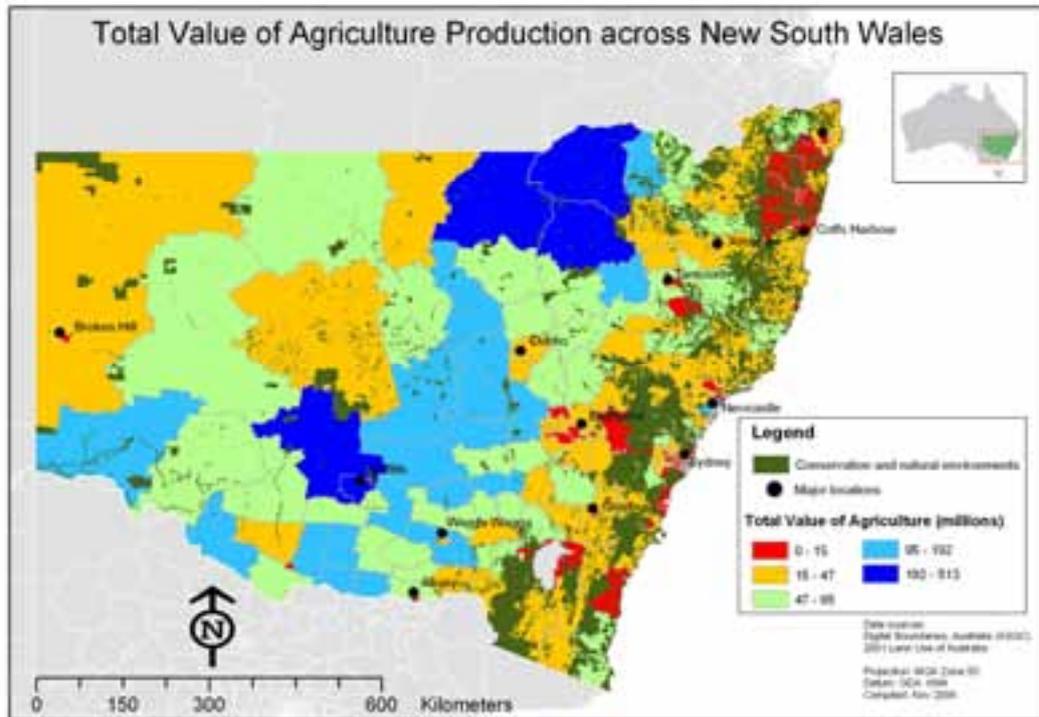


Figure 7. Agriculture, Fisheries and Forestry Employees from NESB.

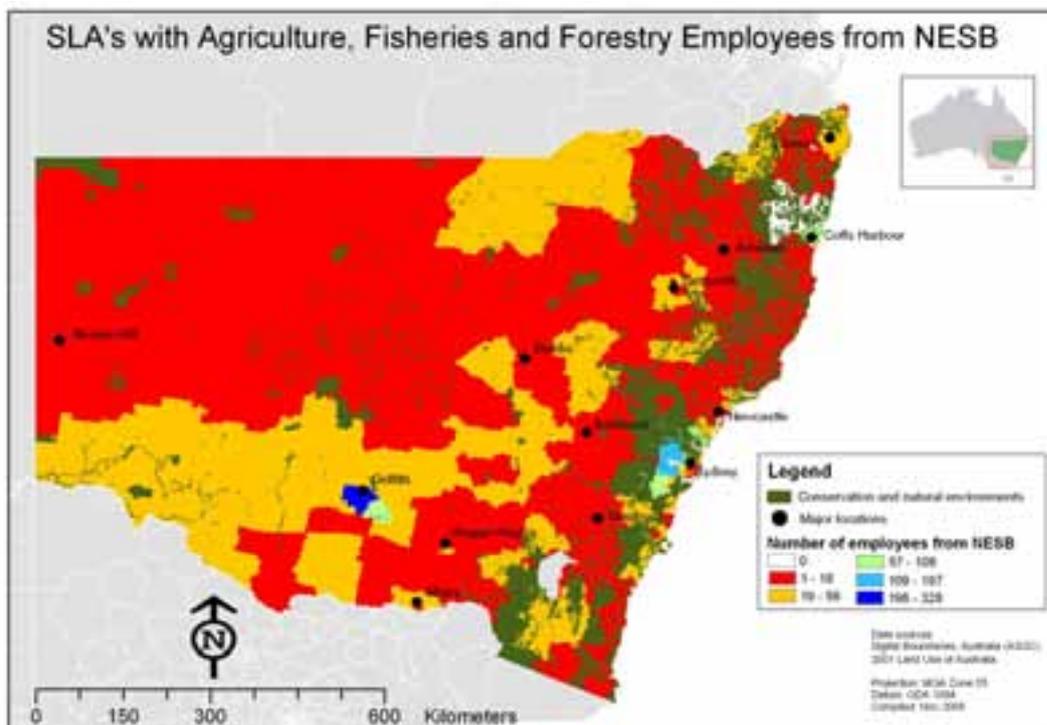


Figure 8. Areas in Tasmania with a High Percentage of Small Farms.

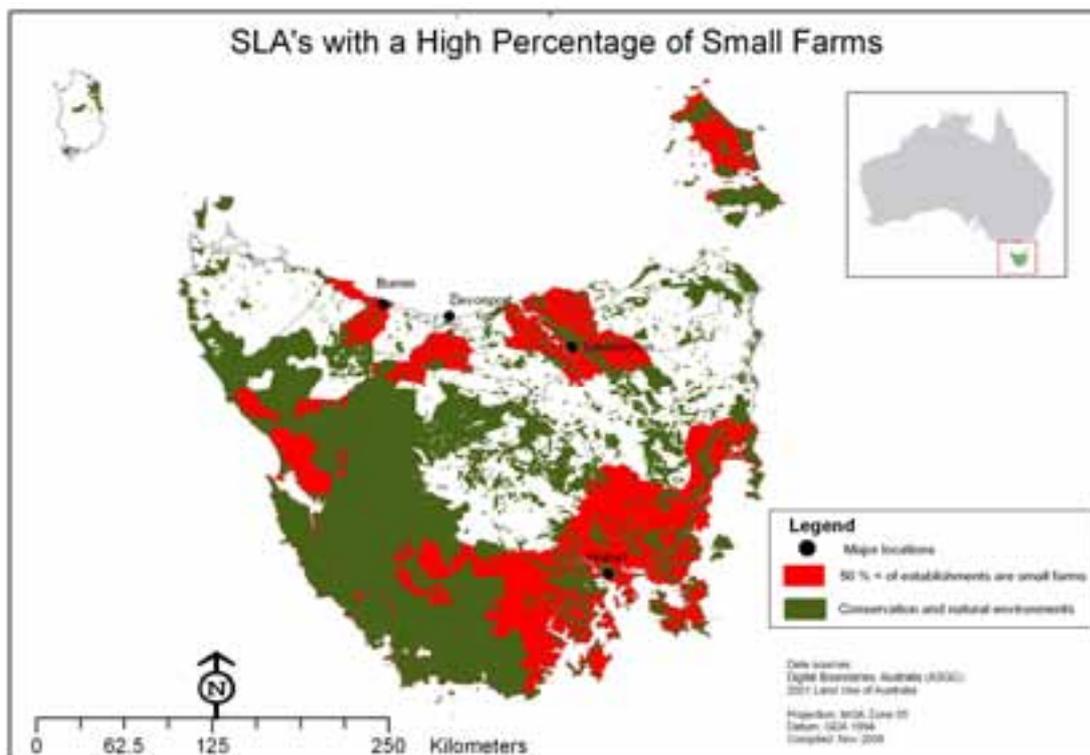


Figure 9. Total Value of Agriculture Production across Tasmania.

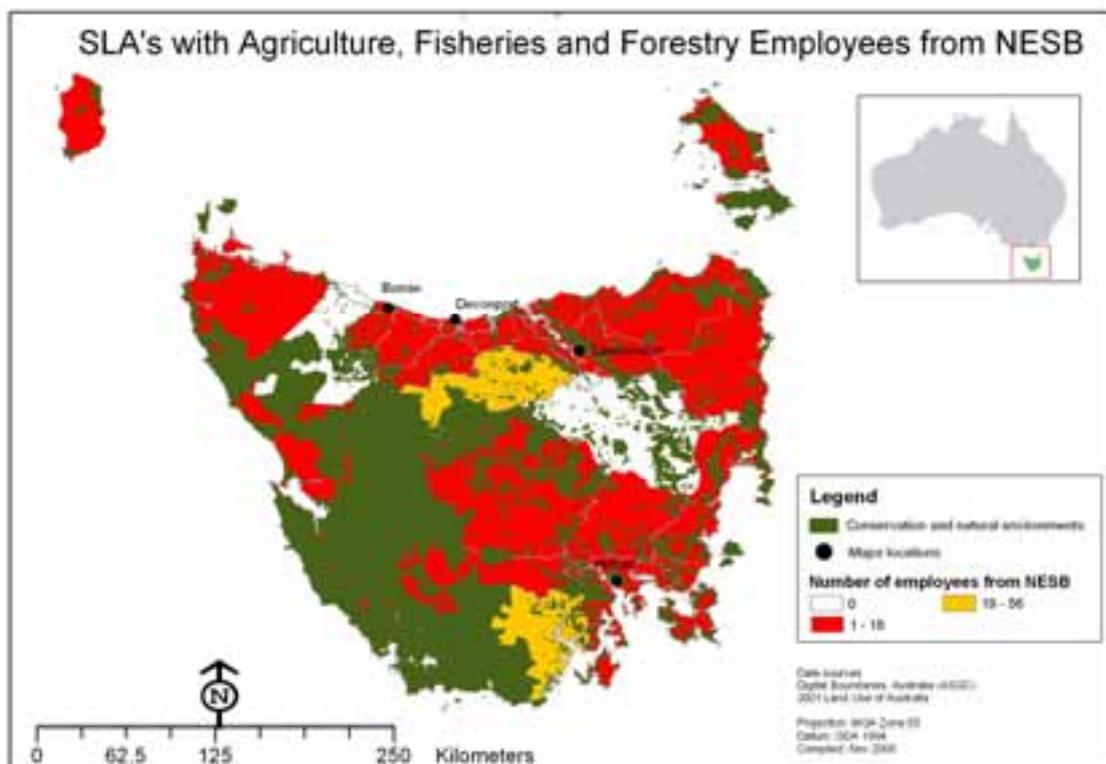


Figure 10. Area in South Australia with a High Percentage of Small Farms.

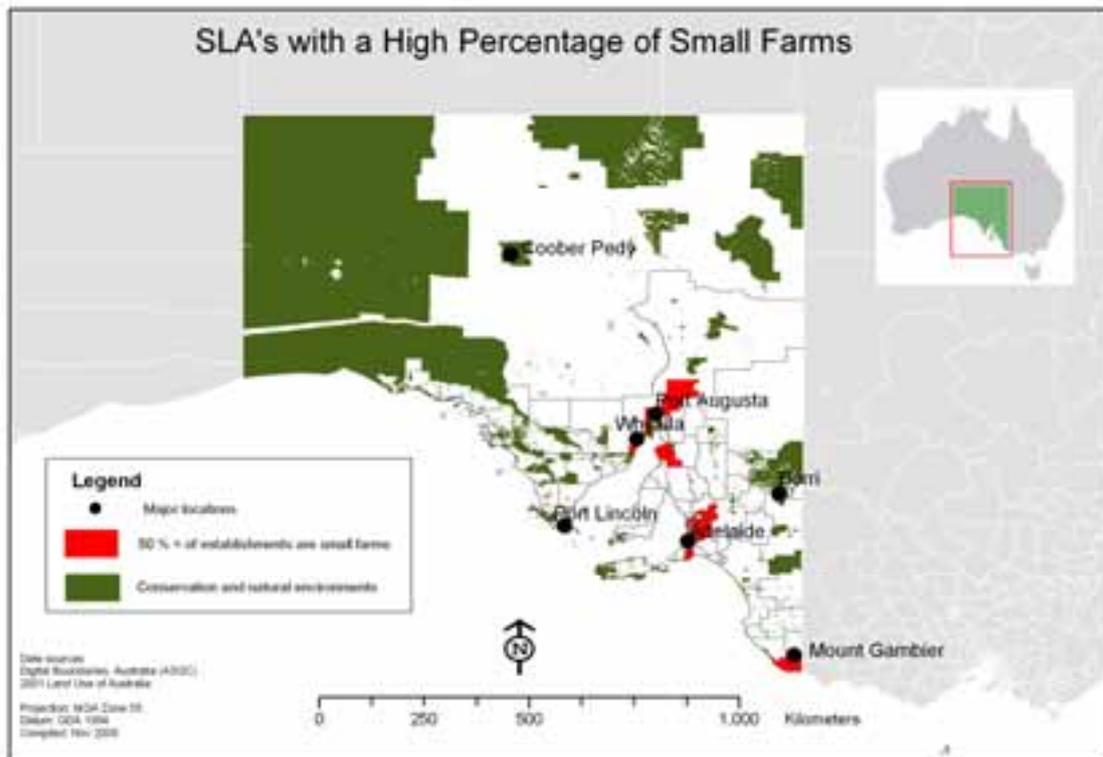


Figure 11. Total Value of Agriculture Production across South Australia.

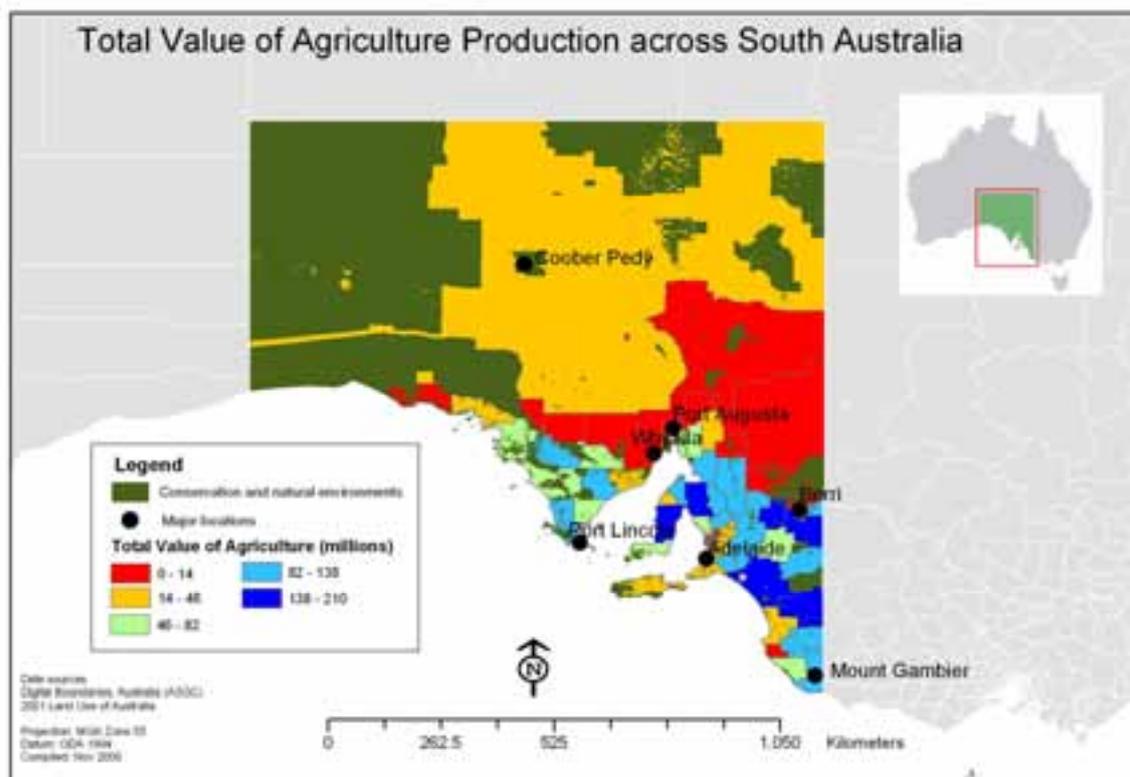


Figure 12. Agriculture, Fisheries and Forestry employees from NESB.

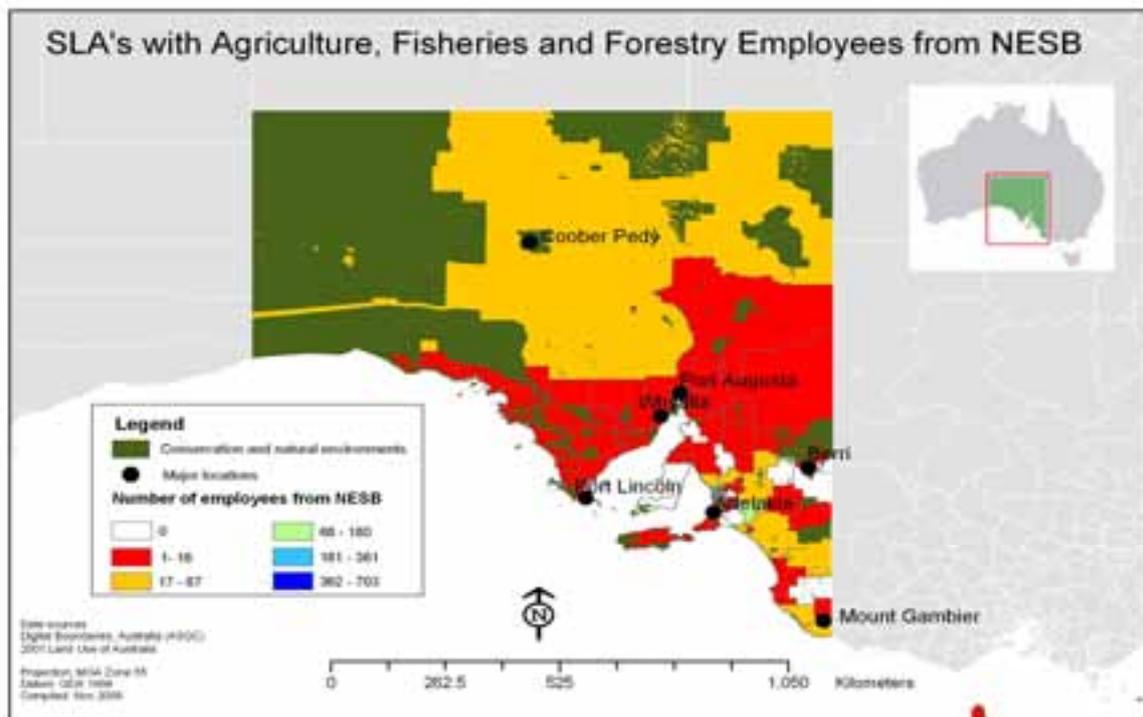


Figure 13. Areas across Western Australia with High Percentage of Small Farms.

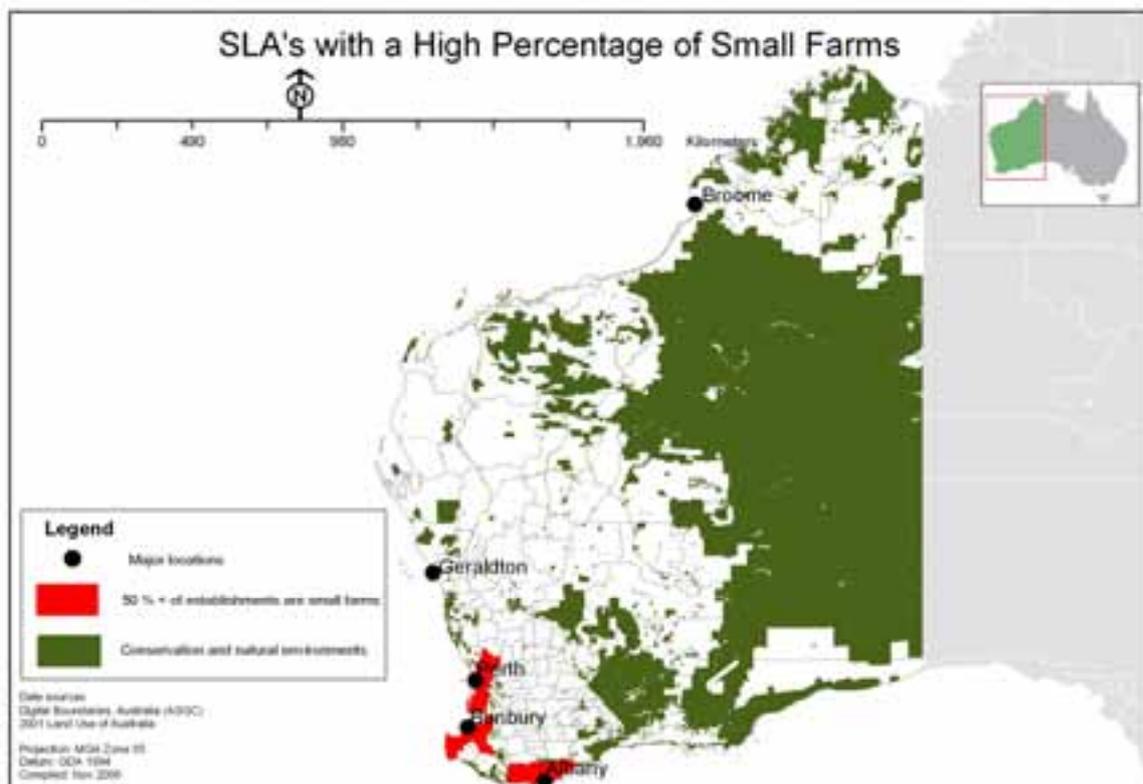


Figure 14. Total Value of Agriculture Production across Western Australia.

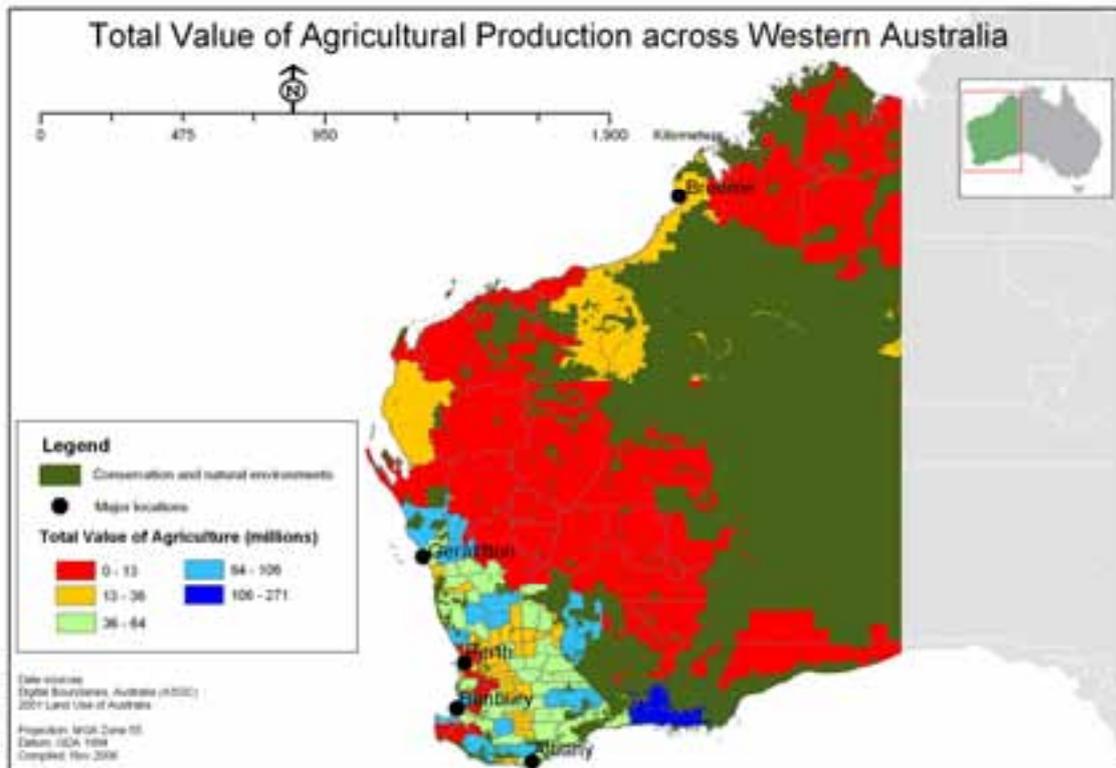
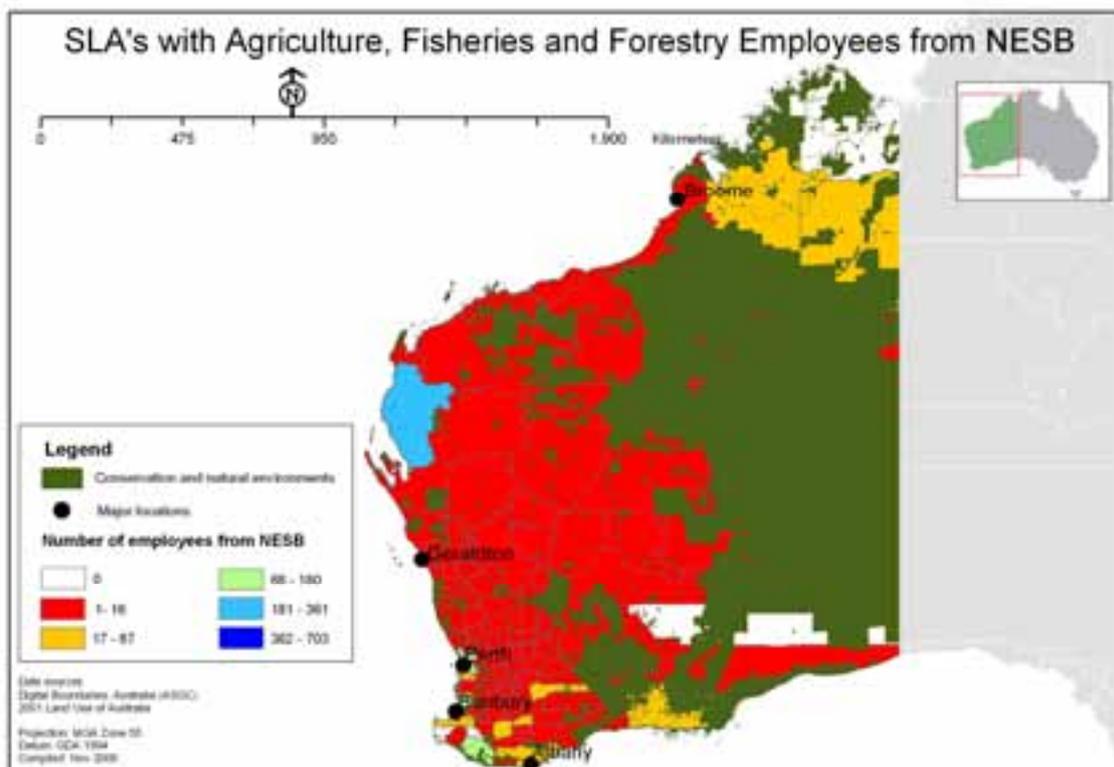


Figure 15. Agriculture, Fisheries and Forestry Employees from NESB.



Stakeholder perceptions of biosecurity risk

This section describes research findings about stakeholder perceptions of small lifestyle landholders and potential biosecurity risks associated with their practices.

A National Forum was convened in Melbourne (June 2006) in the initial scoping phase of the study to gauge the perceptions of professionals working in biosecurity and extension about potential biosecurity risks associated with the small lifestyle landholder segment. Thirty-five biosecurity and industry specialists from Federal and State government departments attended, including representatives from the Integrity, Animal and Plant Health Division of the Australian Government Department of Agriculture, Fisheries and Forestry; Department of Agriculture and Food, Western Australia; Department of Primary Industries, Victoria; Animal Health Australia and Biosecurity Victoria. Government small landholder extension specialists, animal health officers and regulatory officers (chemical standards and pest plants) also attended.

The National Forum was conducted in a facilitated workshop format and included group discussions and reporting on the key focus questions.

- What are the key characteristics of the small landholder sector?
- What are the potential biosecurity risks?
- What do we need to do to reduce potential biosecurity risk?
- The objectives of the forum were to:
 - Build on existing knowledge of the characteristics of the small lifestyle farm sector to develop a shared understanding of the potential biosecurity risks associated with the sector and the implications for government.
 - Increase network linkage with other organisations with an interest in biosecurity and small landholders.
 - Influence current biosecurity programs to include the sector in the development of biosecurity preparedness, response and prevention, communication and engagement strategies.
 - Provide information to guide the research approach of the project.

A pilot questionnaire survey was instigated prior to the forum. The purpose of this survey was to provide a snapshot of biosecurity awareness and small lifestyle landholder to report to the forum. The findings were presented to initiate discussions. A total of 124 small landholders were randomly selected to take part in the survey at the Victorian Small Farms Field Day, held at Lang Lang in May 2006. This location was selected because the area is within the peri-urban fringe of south east Melbourne and is one of the fastest growing local government areas attracting a large influx of lifestyle landholders.

The pilot survey highlighted a limited understanding of the term biosecurity or its connection to their land management practices. Awareness of biosecurity was low. Agriculture was nominated as their main land use but most (73%) were not aware of biosecurity or issues that may impact on their lifestyle or property management. Those that were aware of biosecurity reported weeds as their main concern. Most of the survey participants owned less than 50 hectares and had owned their small holding for less than five years. Most of the respondents (87%) came from urban backgrounds and commuted to their place of employment. The findings were consistent with similar studies (Ashin et al. 2004; Hollier and Reid 2007) that suggest the sector was highly mobile, has limited farming history and biosecurity isn't on the small lifestyle landholders' radar. Participants were asked to list where they would go to receive more information on biosecurity; less than 5% of the respondents recorded

government agencies (Department of Primary Industries, Australian Quarantine and Inspection Service, local government). Most respondents (57%) listed their neighbours as a source of biosecurity information. The pilot survey indicated a low awareness and understanding of the concept of biosecurity and highlighted the need to improve biosecurity communication and engagement strategies.

Findings from the forum

As mentioned previously, the National Forum brought together professionals working in biosecurity and extension to begin to identify the characteristics of small landholders and the possible areas of risk that the small landholder sector may pose to biosecurity. The following session outlines the key findings.

Perceived characteristics of small lifestyle landholder

Perceived key characteristics of small lifestyle landholders that influenced biosecurity risks were identified and are listed below:

- Diversity, mobility and high turn-over of small landholders.
- Poor understanding of land management responsibilities
- Limited understanding of the concept of biosecurity and poor awareness of consequences at the local, state or national level.
- Unrealistic expectations of the environment they are moving into.
- Tend to be interested in the environment and ‘their patch’.
- Hungry for information, strong desire to be seen to be ‘doing the right thing’.
- May not visit the property very often (absentee landholders) and difficult to contact.
- Socially disconnected (agricultural networks) but biologically connected.
- Minimal contact with industry and generally low skill level (weed identification/animal disease).
- Strongly influenced by urban backgrounds and values.
- Land use dominated by hobbies such as fancy poultry, recreational horses, specialist plant varieties (including mixed fruit/nut trees) and a variety of individual or small groups of ‘pet’ farm animals.
- Strong attachment to animals - cure rather than cull culture
- Poor knowledge about available resources and where to seek help or information.
- Interested in quasi-commercial or niche value adding opportunities or animals to supplement income.
- Lack of farming infrastructure (cattle yards/spray units).
- Involvement in alternative practices compared to mainstream farmers.
- Time constraints for regular paddock and stock checks.

Group Discussion Summary

Small lifestyle farmers are diverse: they may be from different professional backgrounds, involved in a variety of industries, adding to the mix of land use. Land management knowledge is low but these kinds of landholders are interested in learning and ‘doing the right thing’.

Biosecurity is not on their radar: the high-risk category is those that care the least about their property, have no property plan or biosecurity management strategies in place, keep a variety of livestock together and have minimal interest in agriculture.

Potential biosecurity risks

Forum participants were asked to identify what they believed to be the major biosecurity threats associated with the sector (see Table below).

Table 1. Stakeholder perceptions of the main biosecurity concerns associated with small lifestyle landholders.

Risky practice	Threats	Other
Feeding swill to pigs	Spread of Phylloxera	Mid-range poultry farms.
Wandering livestock across boundary fences	Hendra virus (spread from horses to humans)	People from non-English speaking backgrounds that do not realise disease as being exotic to Australia because it is native to their county or origin.
Movement of plants and animals from and to farmers markets	Introduction of weeds and lack of weed control	Close proximity of pigs, fowls and humans due to the small size of the property can create an environment that is conducive to the spread of disease.
Non-compliance with legislation and standards including livestock identification systems	Food safety issues such as residue chemicals	Overstocking (It was perceived to be a common perception that many lifestylers don’t understand how many animals they can have on their property)
Sharing stock for breeding purposes	Traceability of livestock	Mixed species of animals in close contact and sharing water/feed troughs
Sharing equipment (including yards)	Poor land management, identification of plant and animal diseases and pests	Reliance on small contractors (spread of plant pests/disease associated with equipment cleanliness)
Poor record keeping (stock identification, movements and chemicals)	Transmission of plant and animals pests/diseases	
Weed management practices		
New stock isolation processes		
Lack of vermin and pest animal control		

Group discussion highlighted that the term *biosecurity* may not be appropriate to use when engaging the small lifestyle landholder sector. It was widely acknowledged that biosecurity was poorly understood by many landholders both small and large and often carried negative connotations – particularly when used by government. Participants of the forum identified that the use of emotive language such as ‘protecting your land,’ or ‘protecting your animals’ or ‘freedom from pests and disease’ as a potential communication strategy to increase biosecurity awareness.

It was widely acknowledged that a balanced perspective was important in future communication and education program design because many small lifestyle farms brought positive benefits to rural communities, the environment and landscape health. As such it was important that the diversity of the

sector was recognised and the sector was not stigmatised. The forum participants believed that typological generalisation may be inappropriate when dealing with the sector. Perception of risks was predominantly anecdotal and further complicated by a lack of data about small landholders' awareness levels and practices. It was widely held view that small landholders were often unaware of the biosecurity risk related to their practices but generally wanted to do the right thing. The group expressed concern that there was a lack of clarity about the make-up of the small landholder group, what they had in terms of livestock or what they did on their property.

Despite the wide range of perceptions about the characteristics of small lifestyle landholders there was a general consensus about these kinds of landholders that was aptly summed out by one participant as:

We don't know who they are, what they have, or what they do?

Limited connection to agricultural networks was perceived to be the major impediment to increase biosecurity awareness within the sector. It was acknowledged that this group of landholders may not see themselves as farmers or even land managers. However, all participants stressed that a special small landholder biosecurity awareness and educational program was needed and should be embedded within the broader industry based campaigns. Compared to small commercial farming, participants felt that small lifestyle farming was about supplementing an income verses interest and lifestyle. Different systems mean different risks. Subsequently, it was important that biosecurity messages and educational programs appealed to lifestyle values. As one participant reported:

It is a question of risk – more often or not they are small farms – so there is a different dynamic to how disease will behave in two sheep and a couple of chooks. It's not a situation where disease will really get going compared to large intensive farms. Plants are the opposite; they are much more connected.

Property size was highlighted because of its influence on the epidemiology of plant and animal disease. Small block size may equate to an ecological isolation – inhibiting the spread of plant/animal disease or pests outside of the property. Although small landholders may not understand biosecurity, the scale of their property and operation may mean they are less of a threat than lifestyle landholders.

It was a widely held view that small lifestyle landholders were likely to be more responsive to biosecurity messages that appealed to both the psychological and sociological aspects of risk perception. Targeting biosecurity messages at a more personal level (health of your animals and family) was likely to improve small landholders understanding of biosecurity risks and influence land management practices. One participant summed it up as:

Small landholders are emotionally attached to their farm animals, they give them all names and describe stock with human attachment, such as my girls.

And another:

We need to look at biosecurity risks through an urban lens and appeal to these values. It is probably very different to the agricultural lens.

Participants believed there was a need to promote biosecurity from a national perspective in common language (for example, 'freedom from pests and disease') to appeal to the small lifestyle landholder.

A range of strategies to build capacity of the sector to mitigate potential biosecurity risks were identified. These included:

- Development of biosecurity risk awareness material distributed through small landholders interest groups and networks (including contractors, rural product suppliers, local government new landholder packages).
- Further development of agency small farm information note series.

- Promotion of biosecurity in small landholder magazines, lifestyle electronic/print media.
- Development of skill development workshops/events/field days that deliver biosecurity messages.

Key areas of concern that the forum participants identified based on their perceptions of the characteristics of the sector and their potential biosecurity risk were:

- Small lifestyle landholders pose a considerable biosecurity risk to Australian agriculture due to sub-optimal land and animal welfare practices.
- Lack of clarity about the extent and magnitude of the biosecurity risks associated with the sector.
- Development of appropriate engagement strategies with the sector for delivery of better outcomes across the biosecurity awareness, preparedness, prevention continuum.
- A need for a long-term, national commitment to raise awareness and improve biosecurity practices of small farmers (hobby farmers, part-time farmers, lifestyle farmers) in peri-urban and regional landscapes.

Gaps in knowledge

Forum participants believed there was a range of knowledge gaps associated with small lifestyle landholders and biosecurity issues. Specifically, these knowledge gaps were:

- The effectiveness of current biosecurity communication and information pathways at a state and national scale.
- Level of small landholder awareness and knowledge of biosecurity at a state and national scale.
- Identification of high biosecurity risk groups within the sector.
- The nature and extent of poor land management practice that may pose risks.
- Level of compliance (ie National Livestock Reporting Scheme, weed control)
- The amount of movement of products and animals through networks such as roadside stalls, farmers markets and garden markets or whether an ‘underground system’ of moving products, plants and animals was common within the sector.

Group Discussion Summary

Although the sector may not be well aligned to industry there is need to further develop these linkages. In this way the sector will be aware of best practice, understand industry requirements and build capacity to identify biosecurity risk and/or change land management practices.

Industries that have or are in the process of developing biosecurity plans need to recognise the location and characteristics of the sector to build stronger alignment.

There is a need to better understand the attitudes, beliefs and mechanisms that are needed to influence a social change in the context of biosecurity (for example, failure of the sector to comply with regulatory approaches). This would ensure biosecurity programs were more efficient and relevant.

Overall, the forum participants believed that:

- Small lifestyle landholders pose considerable biosecurity risks to Australian agriculture, but the nature and extent of the risk remains uncertain.
- There was a need for a coordinated national program to raise awareness and improve biosecurity practices of small landholders in peri-urban and regional landscapes.
- Engagement strategies that were regionally focused or place based that would appeal to the interests and values of the sector were likely to be more successful than broad brush awareness campaigns.

Perceptions of people working with small lifestyle landholders

As part of the study to explore the perceptions of small lifestyle landholders, extension professionals working with small landholders across 15 Local Government Areas in Victoria that feature large numbers of small farming operations and an influx of new small lifestyle landholders were interviewed. As such, the following section describes the key findings from 54 interviews conducted with on-ground team leaders. Interviewees were purposefully selected because of the nature of their positions and we applied a snowballing sampling technique, where existing study subjects are used to recruit more subjects. Officers from the Department of Primary Industries (13), Department of Sustainability and Environment (2), local government environmental and planning staff (27), Catchment Management Authority officers (8) and four non-government natural resource management organisations representatives from Landcare and Trust for Nature took part in the study as part of the Victorian Government special program Services and Information to New Landholders.

Key findings

All interviewees believed that the diversity in nature of small lifestyle landholders brought challenges to services and information delivery and expressed concern that these kinds of landholders had poor understanding of responsible land management practices despite being ‘hungry’ for new knowledge and a receptive audience. Issues associated with land use conflicts (such as weed control, chemical drift, and wandering stock including dogs) were perceived to create tensions between small lifestyle landholders and their full-time commercial counterparts because of differences in aspirations and values. All interviewees believed most small lifestyle landholders had low awareness of biosecurity and this was reflected in their land use practices. The key change drivers in rural peri-urban areas were consistent across the different geographical locations and included:

- Land availability in close proximity to urban settlement
- Changing perception of landscape and environmental values
- The changing nature of agriculture including intensification
- Infrastructure developments (including community services), specifically transport networks for commuters
- The land use planning system as institutional structures and policy measures exert influences on land use and land speculation.

All interviewees believed that lifestyle aspirations played a key role in small property ownership and their description of the ‘types’ of small landholders they worked with. There was a mix of lifestyle aspirations consistently mentioned by the interviewees and these included young families seeking ‘a safe space’ to raise children; retirees aspiring to live a long dream of peace and tranquillity; beginning farmers with aspirations to become full-time commercial producers; investors aiming towards capital

gains, the environmentalist seeking to restore the land or preserve a bush block and the second home owner looking for a country retreat.

We attract all sorts – from young families to professional business people looking to retire in the country.

All interviewees believed that most people who purchased small lifestyle properties come from urban and/or professional backgrounds and derived most of their income elsewhere. Most believed property size was a poor indicator of the characteristics of these kinds of landholders and their land management practice. However, most believed owners of larger small lifestyle properties with some level of agricultural activity were more likely to be aware of biosecurity issues and risk. One interviewee with this perspective summed it up as:

Larger blocks are treated more seriously than small blocks running a few cows that they know nothing about.

Characterising the sector and what they did with their properties was perceived to be more about the landholders' attitude – 'if they think they are a small farmer, they are'. The majority of interviewees believed small commercial scale landholders more actively sought land management information and advice because of their niche market orientation, alternative or value adding enterprises.

Land uses of small landholders and biosecurity risks were considered to be a function of two variables that related to categories or types of small landholders; lifestyle and small farmers.

You can always pick the small lifestyle farmer in the group because he names his animals.

Small property owners are generally tree changers, they often want to have some sort of farming activity, whether it is a few cows or fruit trees and they want it to be part of what they do.

Small farmers are the ones who have a real go. They actively seek to build their business and protect their lifestyle. Biosecurity is a business and lifestyle risk – isn't it?

All interviewees commented that most small landholders had aspirations to be a responsible land manager but lacked understanding and a sense of priority in the context of biosecurity risks. As one interviewee summed it up:

Their hearts are in the right place, but they don't have the technical knowledge to manage their properties.

This was exacerbated by different issues within local government boundaries such as urban encroachment (Mitchell, Cardina and Mount Macedon LGA) and high levels of absentee small landholders (Mansfield, Bass Coast, Hepburn, LGA).

A lot of people who go into these areas don't know much about land management. They {small landholders} have high amenity expectations and very limited farming knowledge. They just don't know what responsible land management means.

Most interviewees believed that biosecurity messages were not on the small landholder radar and as a result biosecurity awareness was extremely low. This in turn impacted on subsequent land use activities and management practices. However, all interviewees working in agricultural extension commented that biosecurity messages were often embedded in topic specific activities on animal production and natural resource management (including biodiversity), but inquiry was low for biosecurity information unless the general farming community or public anxiety was high. Several interviewees commented on information overload and the level of biosecurity information and its suitability to small landholders with a lifestyle focus was a barrier for effective practice change. This widely held perception was summed up by one interviewee as:

There's a lot of stuff out there, people get confused about what is what, who is who, and who is responsible. These people are bombarded with information that is coming from every direction"

Catering to the diversity within the sector and appealing to their value set was perceived to be a major factor that would influence the uptake of messages and the design of programs to increase biosecurity knowledge. As one interviewee put it:

Different landscapes and demographics attract different people; we have doctors, teachers and professional business operators in our Beefcheque group all coming from different directions

5. Small landholder interview findings

This section reports on the findings of a questionnaire survey at a major Victorian small landholder event, stakeholder perceptions of small lifestyle landholders and semi-structured interviews in two case study areas in the peri-urban region of Albury/Wodonga in Victoria and the Midlands/Swan Valley area near Perth in Western Australia. This section is divided into sub-sections and includes discussions based around each of the key research questions listed below. The section concludes with a summary of findings.

- What is small lifestyle landholders' awareness and understanding of biosecurity? Do they connect their land use practices with biosecurity?
- What are the land uses and general management practices of small lifestyle landholders?
- What knowledge do small lifestyle landholders have about on-farm biosecurity risks and where do they source biosecurity information from?
- What are the potential risks posed by small lifestyle landholders to Australia's biosecurity?

Questionnaire survey

A data set was collected using a questionnaire interview process with small landholders who attended the Seymour Alternative Farming Expo held during February 15-17, 2008. The location of the event attracts a large number of small property owners as it is within a popular small lifestyle landholder region due to its amendable landscape and close proximity to Melbourne. The event provided an opportunity to locate people of interest as it was widely promoted as the major Victorian event for people with rural lifestyle aspirations. Small landholders were individually approached to participate in the study. The questions were designed to focus on their land use activities and practices and biosecurity awareness.

In total 64 survey interviews were conducted and most of the respondents owned small properties within a 50 km radius of Seymour. The area is becoming increasingly popular for small lifestyle landholders. Findings highlight the land use diversity feature of small property ownership and were consistent with other studies (see Hollier and Reid 2007; Aslin 2006; Aslin and Mazur 2005). Interviewees indicated a preference for a mix of various levels of agricultural activities ranging from small niche commercial production systems to keeping a small number of diverse animals and a range of poultry (small flock for egg production, purebred show birds, ducks and geese). Commercial beef cattle and specialised small breeds (Dexter, LowLines) were the most common farm animal, followed by purebred sheep (Suffolk, Wilshire Horn), alpacas, purebred goats and recreational horses.

Fewer interviewees reported horticultural enterprises and these were dominated by grape vineyards and/or olive plantations although growing vegetables and small fruit tree orchards for home consumption was (or was intended to be) a land use activity for most of the interviewees.

- Most of the respondents (69%) had some agricultural commercial activity on their property (albeit at various levels) and nominated agricultural production as their main land use.
- A total of 28% of respondents used their land mainly for "hobby" or "recreational activities" and farm interests including keeping a small collection and number of farm animals including horses, and poultry, primarily as pets.
- Less than 5% of the respondents used their property solely for holidays or short-breaks.

Five interviewees mentioned farm forestry, bee keeping and plant nurseries as part of their agricultural activity. All participants had (or intended to have) a selection of farm animals including poultry and had (or intended to have) a conservation/vegetation area. The type and extent of activities and land uses may be a significant factor in their potential biosecurity risk to Australia's biosecurity. Maller et al (2007) also found that diversity in land uses and management practices of small landholders ranged from aesthetic and personal land use purposes (not engaging in agriculture) through to commercial land use with a wide range in between.

Lifestylers' land use was predominantly based around their values and interests in terms of what they did with their time. Similar observations and commonly perceived land uses have been made by Ashin and Mazur (2005), Hollier and Reid (2007) and Maller et al. (2007) on the range of land use activities including novelty animals such as exotic cattle, purebred sheep, goats, deer, alpaca and plant based activities such as mixed fruit and nut orchards, olives, specialised vegetables, berries, herbs and grapevines. This variety of animal and plant products are often used for home consumption or specialised markets focused on gourmet foods (ie goat milk/cheese, meat products, free range eggs and organic fruit/vegetables).

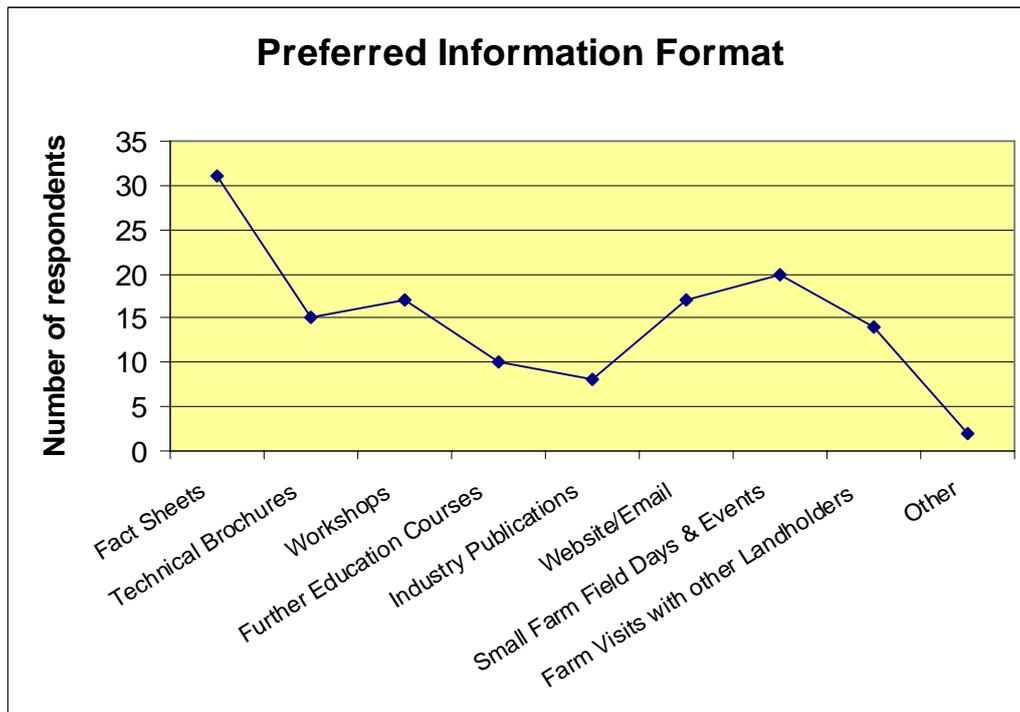
Respondents were asked to provide information on their current occupation and whether they had a farming background before the property was purchased.

- Most of the respondents (86%) were working off-farm and the sample indicated diverse occupational backgrounds ranging from trade to professional workers.
- Nearly half of the respondents commuted to major urban based work from their property.
- The majority (64%) had no farming background before property purchase, however more than half had lived in urban centres within the region prior to property purchase.

To ascertain whether landholders were connected to mainstream industry and agricultural networks, respondents were asked if they were members of any agricultural industry organisation or local community organisations, and whether they held official office in local environmental or farming-based community groups. Nearly one third of the interviewees were Landcare members or involved with in an agricultural organisation (mostly specialised animal breed societies/groups followed by agricultural show societies, the local Victorian Farmers Association branch, Grassland Society). Most of the respondents (82%) were not involved in any local service community group(s).

Respondents were asked to indicate their preferred way to receive information and what information topics would be most useful to build greater understanding of land and animal management responsibilities focused on biosecurity. Fact sheets and small farm field days/events were the preferred method to access information; and the topics most favoured were weeds, plant pests and diseases (including native vegetation and animal health). Educational programs that focus on the principles of adult education and build on the principles of reducing biosecurity risk in the context of whole property planning were favoured. Comments included biosecurity planning aspects such as animal isolation areas, water point location, care of animals and plants. Several participants commented on the value of providing simple checklist style information sheets.

Figure 16. Preferred Information Format.



The majority of interviewees were not aware or not sure of any biosecurity measures designed to protect their land from harmful plant/animal pests and disease. Most reported they could not or were unsure about how to recognise harmful pests (plants) and diseases (plants/animals). When asked to describe their management practices to protect their land, animals and crops, and the health of their family from potential biosecurity risks a set of five groupings emerged - weed identification and management; appropriate chemical usage, regular stock checks and what to look for (animal health and pest identification) and the importance of good fencing. Responses highlight the need to promote biosecurity to the small landholder sector to improve awareness and understanding of biosecurity risks (weeds/insect pests/vertebrate pests/animal diseases and infestations) and the practice of good property hygiene and stock health regimes. This confirms previous research findings in peri-urban Australia that there is a lack of knowledge about animal and plant pests and diseases amongst small landholders in peri-urban Australia (Maller et al. 2007). In her study the majority of stakeholder interviewees believed that small landholders did not possess adequate biosecurity knowledge relevant to their properties.

Those who believed that small landholders did have adequate biosecurity knowledge were generally referring to small landholders with a small scale commercial operation and business focus. Despite the small sample size and scale of agricultural activities, this component of the study suggests an urgent need to investigate small landholder perceptions of what constitutes a biosecurity risk and what motivates land use practice knowledge and subsequent actions to reduce risk.

Table 2. Biosecurity Awareness and Knowledge.

	Yes	No	Unsure
Awareness of biosecurity measures	30	26	8
Knowledge to recognise and manage biosecurity risk			
- Harmful pests	15	13	24
- Disease (plant/animal)	14	14	25
- Weeds	29	7	20
- Unwanted animals/birds (vermin/feral)	27	11	17

Semi-structured interviews

Twenty-eight semi-structured interviews were conducted with small lifestyle landholders in Victoria and Western Australia. The interviewees in the case study were selected by referrals from key stakeholders working with the sector and a snowball process previously described. Only small lifestyle landholders that kept a range of farm animals were interviewed. The locations were selected because of the high density small lifestyle property ownership and agricultural land use in these areas. Both locations were also part of state government small farm information services. Most of the interviews were held on the property (two were conducted at their urban residence, another at a convenient urban location) and included a farm walk. Most interviewees or their partner had a previous family connection to agriculture particularly growing up in a rural setting and all worked away from their small property. Occupations of the interviewees ranged from part-time to full-time employment as tradespersons, rural merchants, teachers, business administrators, small/medium business owner/operators and medical professionals. Most interviewee partners also worked off-farm in part-time or full time positions. Four interviewees used their property as a second residence and divided their time commuting between their urban and country properties.

Interviewees had purchased their small holding within a sub-division cluster to build a ‘dream’ home and shedding, or had purchased the homestead portion of a larger traditional farming property for restoration or demolition. One absentee owner had inherited the property, maintained the house for personal use and was surrounded by larger full-time farming neighbours. However, less than a third of the interviewees had one large full-time farming neighbour. All interviewees were within a 30 minute drive to a major regional centre.

Land use

All interviewees owned a diverse range of farm animals, some in small numbers (at least two of each species) and were actively engaged in some level of agricultural activity that was motivated by a range of factors including lifestyle aspirations, market opportunity (to produce for a niche small lifestyle market) or aspirations for economic viability.

We describe our place as a working farm, it is not a hobby farm by any stretch of the imagination, it is half our income.

We bought the farm because of its outlook There is nothing better than leaving home for work and coming home from work and looking over the countryside.

Livestock grazing pastures with supplementary feeding was the dominant land use. Two landholders were engaged in full time farming activities on their properties and did occasional off-farm work and

another was in the process of relocation from their city base employment and residence to their country 'semi-retirement retreat' to breed cattle full time. Most interviewees had a collection of farm animals and poultry on their properties and those that kept one kind had cattle. These included properties with small purebred commercial beef herds, and the rarer smaller breeds such as Dexter and Miniature Belted Galloway cattle kept as small commercial studs or primarily as pets. Most of the smaller sized property owners that had cattle, had mixed age and breeds. One interviewee (absentee landholder) owned two commercial breed cows and calves but leased most of his 45 hectare property to neighbours to graze sheep. All interviewees kept farm animals for home consumption and/or to supplement the household income, except one that only kept recreational horses. Ten livestock owners kept a collection of livestock as a herd of animals (between 6-100 animals), specifically as a small business opportunity (traditional beef breeds (3), miniature cattle (5) and goats (2)) and the balance kept farm animals primarily as pets. Two interviewees kept a range of farm animals specifically as pets and for home consumption but operated a small non-animal based business from the farm – hay cutting and a fruit orchard. Cattle were the most popular choice of livestock. Previous studies have indicated that cattle are the preferred livestock for many small lifestyle farmers within an increasingly gentrified peri-urban landscape in picturesque areas (Barr et al 2005) because of their ease of care compared to some other farm animals, ability to keep excessive pasture growth in check and appeal to create rural ambience (Hollier and Reid 2007).

Table 3. Land use of small lifestyle landholders.

Land-use			
Livestock	No. of properties n=28	Horticulture	No. of properties
Beef cattle	18	Small orchard fruit trees (citrus, stone, pome)	12*
Sheep	6	Olive grove and grape vines (home consumption)	5
Goats	3	Home garden vegetables for family use only	18
Horses	6		
Alpacas	4		
Dairy cattle	1		
Poultry			
- chickens	20		
- ducks	8		
- geese	2		

* One commercial producer (contract fruit grower and permanent seasonal roadside stall)

Two interviewees had a mix of animals in a confined area where different species mingled. However, the researchers observed many mixed species of animals mingling in paddocks in peri-urban areas during the field trips to visit the small landholder who had agreed to take part in the study.

The interviewees collectively appeared to have a strong desire to well manage land, care for livestock and production was often directly for home consumption, with some selling their stock off-farm. All interviewees had a strong interest in the food chain and a preference for home-grown products.

Keeping small farm animals appeared to be favoured by most of the interviewees. There was a common perception that small breeds of animals, particularly cattle, were easier to handle and more docile. As one interviewee explained;

I have goats and miniature ponies because I can handle them.....my husband isn't around as much as me so I need to be confident.

Motivations for small property ownership offer some explanation for the diversity within the small lifestyle landholder group and their land management practices. Maller et al (2007) suggests the type and extent of activities and land uses that small landholders engage in may be a significant factor in their potential biosecurity risk. When asked to consider personal motivations for small property ownership and land-use activities, interviewees described a wide range of factors. Aggregated responses were grouped and are listed below:

- Quiet and relaxing environment in a rural setting
- Buffer zone from neighbours, privacy and seclusion
- Lifestyle choice, aspiration to live in the country and be closer to nature
- Love of animals and the space to keep them
- Recreational and hobby pursuits (gardening, keeping poultry, having big sheds for storage)
- Interest in machinery and ‘working the land’ (tractors and farm implements)
- Keeping and preserving unusual breeds of animals and poultry
- Self sufficiency (growing own food) and a healthier outdoor lifestyle
- Environmentally friendly lifestyle and home, alternative living
- Opportunity to supplement income and be ‘my own boss’
- Land to expand an idea into a business (novel livestock)
- Getting into farming for pleasure and profit; desire to practice farming
- Future retirement.

Awareness of biosecurity

All interviewees had some understanding of biosecurity risk and the potential implications for themselves. When asked to describe what the term ‘biosecurity’ meant to them, interviewees offered a broad range of different views, beliefs and attitudes. However more than half of the interviewees were observed to struggle with describing the term biosecurity and linking biosecurity risk to their specific land management practices. Generally the term biosecurity in the context of what small properties did with their land appeared to be poorly understood.

It’s about.....I don’t really know what it means but I think its about disease threats.

Biosecurity doesn’t touch me in a lot of ways....not in our area.

This finding may have implications regarding the best practice knowledge base of small lifestyle landholders or may simply reflect a lack of connection in their activities to biosecurity risk or the relevance of the term to their every day land management practices. Nevertheless, the extent of small lifestyle landholder’s awareness and understanding of plant or animal pest and disease, and exotic pests and diseases that are currently not established in Australia (ie. FMD, swine fever and avian influenza (AI)) relevant to their property and land use is important in determining the extent to which these types of landholders present risk to Australia’s biosecurity. Overall the level of understanding of biosecurity and its potential impact on mainstream agricultural biosecurity associated with their land use activities was poor. Some interviewees questioned the relevance and priority of biosecurity in the context of their small lifestyle farming operation. As one interviewee put it:

Biosecurity is not really need to know information.....it is information that you seek if you have too.

However, the interviewees that could readily describe biosecurity concepts and relate this to their own land-use mentioned both plant and animal diseases and pests. There was an overall consensus that biosecurity was an important issue for all landholders.

It's about keeping out the nasties {pests and disease} and good on farm protocols.

Biosecurity means keeping disease out and if you have got a problem, keeping it in.

For most interviewees, small property ownership and learning about farming was an iterative process and carried a suite of obligations to protect the environment. There was a continuous 'learning the ropes' attitude to land management practices.

We didn't know what our land management obligations were when we started....We all need to get our heads around our land management responsibilities, as well as understand our obligations.

The sense of moral obligation throughout society may be a significant motivation explaining much of the evidence on compliance behaviour (Sutinen and Kuperan 1999). The level of awareness and understanding of biosecurity displayed by the interviewees in this study was most often linked to the threat of weeds and land management operations underpinned by social factors to be seen to be 'doing the right thing'.

I haven't worried too much about it [biosecurity].....I am aware of it from a weed point of view and keeping the place free from weed.

Biosecurity means keeping out weeds; stopping spread of weeds to my neighbours.

All interviewees put emphasis on aesthetic, recreational and real estate value of their small holdings, rather than economics associated with potential agricultural productivity gains. The aesthetic aspirations rather than economic aspirations associated with land use appear to play an important role in what lifestyle do with, and have on their properties. For small lifestyle focused landholders this may provide a window to promote biosecurity practices. Linking aesthetic appeal to the notion of 'doing the right thing' within the context of biosecurity (for example, a neat, treed, well fenced stock isolation area or pens) is likely to appeal to these kinds of landholders.

I want my farm to look good from the road and be well plannedto be a good example of land management and stock. A sign at the front gate promoting it {biosecurity} and my place would be great.

A disconnect between owning farm animals for pleasure and owning farm animals as an integral part of a farming business was amplified during the interview process with landholders that owned small holdings less than 5 ha primarily for lifestyle. These interviewees happily described their farm animal collection as their 'pets' and attached strong human emotion to their care and welfare. Livestock were fed commercial rations daily and/or had a continuous supply of hay. Feeding time was widely acknowledged as part of a 'bonding ritual' and an opportunity to be with the animals.

All our animals have names to match their personalitieswe treat them like our children.

I had to go out and get another one in a different colour because I just knew she was lonely.

At the other end of the spectrum, small lifestyle landholders with larger properties saw their operation as an agricultural activity, even if it was at the small or hobby scale, and believed their land management practice was similar to other farmers. The stakeholders interviewed as part of the study believed that small lifestyle landholders with larger properties had more agricultural activity

(particularly if the property was a farm subdivision) and as such land management was generally higher than landholders with small blocks.

Interviewees were asked how often they checked their stock and who they would contact first for an animal health concern. Most interviewees indicated they would contact a veterinarian if they had an animal health concern or their neighbour depending on the issue. However, the degree to which veterinary services were used appeared to be diverse, either high usage or not at all. Two interviewees reported difficulties in sourcing veterinary services. This suggests that if veterinary services are part of a risk management structure, these services need to be more accessible and regarded more highly by the end users. However, overall ensuring the health and welfare of their animals was a high priority for all interviewees.

We had one lamb that went blind so we took it down to the vet so he could look at it. Touch wood, apart from a bit of lice in the cattle, we've had no real problems. We do monitor them daily and we are particular about their health.

I tend to look for local advice. When I have had problems with mastitis in the past, I talk to the local dairy farmer down the road, raid his drug cabinet.

In regards to reporting, if it was something unusual I probably would. But when a calf dies of scours it is fairly obvious what it died from. Because we cull the old animals out they don't tend to drop off on the place.

All interviewees that lived on their small property reported that they regularly checked their animals and paddocks. This was strongly influenced by the close proximity of their animals to their home and recreational activity.

I just have to look out the backyard to check my stock and we feed them most days so I can get a good look at them then to monitor their health.

We check our stock daily..... generally I go for a walk with the kids after work or I get up early every morning and go for a walk before work.

Most interviewees believed that reducing the spread of weeds and diseases were their key land management responsibilities. This influenced their interpretation of biosecurity and what it meant to them.

Biosecurity is practices in farming to minimise disease and weeds on the property and spreading elsewhere.

Biosecurity is aimed to limit the transfer of noxious plants from property to property.....and animal disease I guess.

Natural resource management biosecurity issues such as established weeds and pest animals, although not the main focus of this study was mentioned repeatedly as a biosecurity concern. Most interviewees commented on the importance of limiting the transmission of pests and diseases on their properties when explaining what biosecurity meant to them.

Biosecurity is a common sense approach to stop transfer and introduction of disease and unwanted pests.

Interviewees that had invested time and money into their small business enterprise were generally more aware of biosecurity issues and their land and animal management responsibilities as part of the agricultural community.

It {biosecurity} is safeguarding integrity of the property and animal welfare.

Biosecurity means knowing what you bring in and take out from your farm.

Land management practices

Interviewees had a diverse range of activities on their properties predominantly based around personal interest, novelty livestock ownership and aesthetic appeal. This diversity in land use was reflected in land management practices.

We bought them [Alpaca] partly as lawn mowers and partly because we didn't think about it in terms of management.

Stock movement between small landholder neighbours and friends was a common practice. Short-term agistment of stock (usually for mating purposes), loaning animals for 'lawn mowers' and using other small landholder paddocks for opportunistic grazing were mentioned by several interviewees. Two interviewees had used artificial insemination.

At the moment I have got four cows down on the neighbours place. It had a bit of grass on it so when the new owners bought it, I tapped them on the shoulder and asked if I could put my cows there for awhile.....I did up the fences for them.

Small equipment was often borrowed from neighbours (or family members), however nearly all interviewees had some type of fencing equipment and small animal health equipment such as drench guns. Interviewees also had a range of larger agricultural equipment including small tractors, spray units, all terrain vehicles and cultivation equipment. Interviewees had a range of traditional farm infrastructure including shedding (hay and workshop), rudimentary pen or yard systems with and without a crush or loading facilities. Interviewees with small herds as part of a business strategy had the most infrastructure and improved animal handling infrastructure such as steel yards with veterinary crushes.

Most interviewees relied on purchased stock feeds for their animals from the local rural merchandise business. All interviews emphasised the importance of supplementary feeding of specialised products. Daily trough feeding was a common practice. All interviewees purchased a range of stock feed to supplement their paddock feed. These commercial products ranged from bagged mixed grains, pellets and hay. Specialised products (natural additives) were also used.

I load the back of the car up with three different types of food; special pellets for the alpacas, special pellets for the cows and layer mix for the chooks once a fortnight. If we have calves they get special food.

We don't grow enough grass to feed our animals as well as we would like to, so we buy feed most weeks.

Pasture management for plant growth as a feed reserve was not a major concern for most of the interviewees, particularly those with smaller allotments. They grazed whatever plant material was available and mowed areas that became too overgrown. Three landholders had sown areas to new pastures. Only one interviewee mentioned a fertiliser strategy for their property. Three interviewees cut hay using contractors, including one interviewee that cut hay (more than 250 big rolls and 2,500 small bales last season) to generate the sole source of property income.

All interviewees had weed control strategies. These included chipping out weeds, spot spraying weeds with backpack units or small chemical spray units or contracted professional services. Size of the property, weed identification skills and personal reasons such as avoidance of chemicals or pride were key factors mentioned by interviewees that influenced weed control activities.

The bloke next door {commercial farmer} is always telling me one seed equals seven years of weeds, so we're pretty vigilant here.

I really enjoy working around the place and digging out the weeds... it makes me feel good, I am looking after the environment.

All interviewees viewed weed control as an essential part of 'caring for the land' and being a 'good' farmer.

Weed control is essential, if you get rid of the stuff say Patterson's Curse, it swamps our pasture and the plant species we want to encourage.

I can't grow good pasture for my stock without weed control.....it's a critical thing in my game.

We had a flower in one of the paddocks and we thought it might be rare and we would have to fence it off. And he {agency pest plant and weed officer} came out and had a look..... no, you don't have to worry about him.

There was a wide range of practices that expressed alternative personal values and a mix of management strategies.

We spray them. Some times we chip them out. I spent a whole season chipping out thistles and then found that I hadn't chipped them low enough for them not to come back, so we are just going to spray.

With our permaculture philosophy..... We have not used poison.

If we could get some non-chemical method {for weed control} we will be certainly willing to try that.

Professional contractors were frequently used to manage weed infestations but with limited success.

Last year we arranged for someone to do it and we brought the chemicals and he came and said it was too windy and he didn't want it to blow into the vines over the road. And he was going to come back a week later and he didn't come. By the time I realised, he hasn't come back it was too late.

But you can never get someone to spray your weeds when they need to be sprayed. Because everyone wants them to be sprayed at the same time, everyone wants paddocks renovated at the same time.

Several interviewees reported issues about accessing appropriate information. Personal time constraints and priorities were also mentioned as impediments to implementing weed management strategies.

I have just got too many other things to do at the moment {to worry about weeds} there is just too many other things to research about....

Environmental values may often clash with issues around pest management. One small farmer, in which a large percentage of their allotment is dedicated to remnant vegetation, comments on controlling rabbits;

One of the major issues, and I dare say this is with small farm owners in terms of the bush is we don't particularly want to go and clear out all the logs and understorey and all that, which is good rabbit habit but we don't particularly want the rabbits there for sure. We want to keep the biodiversity all the little micro-organisms and all that.

Interviewees believed weed and pest identification was an important skill. For those that purchased hay, credibility of the source, specifically its weed free status was deemed to be extremely important.

All interviewees kept records about their farm activities, particularly stock, including in some cases photographic records. Given the nature of small lifestyle landholders this is not surprising. However, most interviewees were complacent about applying animal identification systems. The identification of individual animals did not attract the same level of detail. Compliance with the National Livestock

Identification Scheme (NLIS) was not consistent across the sample. NLIS is a traceability system for cattle, sheep and goats to ensure food safety, product integrity and market accessibility by providing whole-of-life movement and ownership history of stock. Only one interviewee was not aware of the NLIS program. However, most believed that NLIS was not a concern for them, mainly because they did not see themselves as part of the agricultural industry and rarely sold animals. A lack of equipment and/or appropriate handling facilities on some small properties was likely to influence this perception.

Sources of livestock and trade

Animals were sourced from a wide range of places. These included regional market saleyards, other small landholders, and advertisements in the local or farming newspaper or directly from breeders of speciality or novel animals. The movement of animals is a long recognised risk factor for the spread of pathogens (Woolhouse & Donaldson 2001). Four interviewees regularly sourced and sold their livestock through traditional livestock markets. Two interviewees that ran a livestock based farm business reported that they had purchased stock from interstate. For the others, animals were often swapped or bartered for other products or animals, and for those at the smaller end of the property size spectrum, simply given to the interviewees from friends as gifts or neighbours/friends as unwanted animals. Some collected their animals because the opportunity arose.

These cows were little skinny runty calves that our friends didn't want.....but they grew alright.

I got these from the local market. I guess nobody else wanted them because they're small.....I thought they were really cheap.

In comparison, fruit trees were mainly purchased from nurseries and retail outlets. All interviewees that had small orchards, used the product for home consumption and had a wide collection of mixed trees.

Interviewees sold their products through local, direct and informal sources. Those at the large property end of the spectrum sold products through traditional markets including one landholder that supplied a wholesale market. This landholder also sold product directly to the public from the farm gate. Several interviewees believed that the use of local and informal sources to sell product had been reduced because of the introduction of Property Identification Code (PIC) and the National Livestock Identification Scheme (NLIS). However, trading animals for home consumption was perceived to be a common practice. Some interviewees also reported undocumented livestock movement, which supports anecdotal evidence that there appears to be a level of unorthodox trading.

Sources of information

Interviewees mentioned a wide range of information sources to assist them in their property management endeavours. These included newspapers, books, magazines, field days and special events. Friends and neighbours were mentioned by all interviewees as a source of valued information. Most of the interviewees belonged to interest groups based around what they did on their land (ie, specialist breed societies, Landcare, Organic Growers Association, Herb Growers Group, Garden Clubs, Historical Society) reflecting the inherent diversity within small lifestyle landholders dependent on individual interests, backgrounds, longevity of land use and experiences. State government extension programs that targeted the sector were widely acknowledged as an important information source for good biosecurity practice, particularly in Western Australia. On-going relationships with Department staff had strongly influenced on-ground practice change.

One small property owner who had been on the land for a period of time summarises his thoughts on biosecurity information as:

I think it is just education; you have got to get that information out to people and just make sure they do it.

Most interviewees regularly used their computers to find out information. The internet was perceived to be a great source of background information.

For me it is like flicking through a magazine. This is what I wanted and I'm interested in and once you have got two or three links it's like opening the door for you. I have got a list of favourites in the hundreds.

If I needed information on a possible biosecurity issue I would go to the government website or look at other websites. Mail things never really get read, most people throw them straight out. Biosecurity is not really need to know information, it is information that you seek. I think the challenge with something like biosecurity is getting people interested.

Social networks played an important role in information dissemination and influencing appropriate land management behaviour.

We get most of our information from the neighbours but I don't know if they are really up to speed about biosecurity.

Most interviewees that had actively sought biosecurity information commented that it was readily available but it was too complicated and didn't relate to their 'unique' operation.

"There's a lot of technical information on weed management and animal production but its information over load for me when I don't know what the important bits are for my situation"

Risky practices

This section explores the land management practices of the small lifestyle landholders who took part in the study to begin to describe the risky practices that pose biosecurity risk to mainstream agriculture and the environment. Understanding the occurrence of risky practice is an important component of the conceptual risk management framework applied to this study. It provides a snapshot of the areas of communication that need to address the biosecurity risk.

Biosecurity risk can be described as a combination of probability, frequency or occurrence of a hazard and the magnitude of its consequences. In this study, we found that small lifestyle landholders carry out a range of land use practices at varies levels that could be considered to be risky practices for biosecurity. These risky practices ranged from poor weed identification and subsequent management to trading livestock in unregulated markets.

Coupled with low awareness of biosecurity the land use practices carried out by small lifestyle landholders influences the probability or the measure of uncertainty, as to whether small lifestyle landholders' pose a biosecurity risk. Overall the knowledge level of agricultural practices across the sample within the study was generally low, primarily because agriculture as such was not the main interest of this group of landholders. This low agricultural knowledge of small lifestyle landholders is likely to influence the early detection of a potential biosecurity issue or increase transmission pathways and as such increases the probability of a biosecurity risk attributed to the sector.

The following table (Table 4) is based on the aggregated responses from the study. It focuses on five key common land management practices drawn from the data that pose risk to mainstream agriculture based on the frequency or occurrence of the hazard. The frequency or occurrence levels suggests a level of risk associated with a particular land use practice however, in some situations such as non-compliance to animal identification the magnitude of the risk, because of the consequences, is highly significant from a biosecurity perspective.

Table 4. Land management practice and risk.

Practice	Biosecurity issue	Occurrence (n=28)	Comment
Keeping a collection of different farm animals and/or poultry in close proximity	Increased risk of transmission of pests and diseases.	28	Participation in agricultural activities irrespective of scale increases biosecurity risk and raises implications about potential biosecurity risk associated with small lifestyle landholders practices.
Local, direct or informal trade of livestock and/or product (Trading in unregulated markets)	Traceability and transmission	22 6 2	Direct trade with neighbours, friends, acquaintances Farmers' and other local markets Direct sales (roadside) Some evidence of non-compliance to NLIS.
Weed management	Incursions and transfer	Varies levels across the sample	Low weed identification skill generally acknowledged. Alternative practices to using chemicals preferred.
Sharing of equipment Ensuring agricultural equipment coming onto the property is clean and free of contaminants	Transmission of pests (including weeds) and plant/animal disease	25	Sharing/borrowing equipment common practice. Contractors used regularly (spraying, fencing, feeding)
Sharing animals for mating – taking animals off the property or keeping an animal for a specific time period for mating	Transmission	8	Disease transfer
Associated practices			
Knowing what to look for (pests/disease) and reporting anything unusual	Lack of knowledge	All interviewees expressed a lack of knowledge in plant and animal pests and disease recognition.	Wide range of knowledge levels but all interviews said they would actively seek advice if they thought they had an issue and report.
Calling a veterinarian	Recognition of animal disease and welfare	All interviewees indicated they would seek veterinary advice but would initially seek advice from friends or neighbours depending on the issue..	Strong emotional attachment to animals and their care displayed in small property owners with lifestyle focus. Farm animals kept as pets and/or home consumption.
Isolating new or sick animals	Transmission	6	Dependant on facilities. Most small lifestyle landholders did not isolate new or sick animals. Low early symptom detection skill
Controlling vermin and pest animals	Transmission of pests/diseases	28	Control strategies in place

Practice	Biosecurity issue	Occurrence (n=28)	Comment
Checking the origin of feed materials	Spread of weeds	20	Strong preference of commercial rations and optimum quality fodder free from weed seed
Limiting visitors to livestock work areas.	Transmission	0	No off-limit areas for visitors. Active encouragement of interaction with stock.
Mix of land use activities within clusters of small lifestyle landholders and commercial farms.	Increases risk of introducing new pathways for the transmission of various diseases and pest plants.	All	Diversity and close proximity of other small farms and adjoining boundaries to larger traditional farming operations.

Summary of findings

The findings presented in this report address some of the gaps in knowledge about small lifestyle landholders and their potential biosecurity risk. Four main question themes were addressed and key findings are summarised below.

What is small lifestyle landholders' awareness and understanding of biosecurity? Do they connect their land use practices with biosecurity?

The term 'biosecurity' may not be readily understood by small lifestyle landholders but most appear to have an idea of its meaning and couched this in terms of the care of their animals, plants and land. However, the link between awareness and understanding of biosecurity and land management practices appears to be a tenuous one. Findings suggest that the awareness of biosecurity and understanding is linked to a range of social factors including self-sufficiency, personal environmental values, networks and genuine desire to do and be seen to be doing the right thing. The connection of biosecurity to land use practice was not well established. Those involved in a niche market or small business venture appear to have greater biosecurity awareness and understanding and this was often translated into practice.

It was found that most small lifestyle landholders do not consider themselves to be part of mainstream farming and/or industry groups. Most small lifestyle landholders do not identify themselves as traditional farmers, and hence feel they don't belong in the same mainstream networks. This is likely to impact on biosecurity awareness and understanding as most biosecurity awareness campaigns have a strong industry focus.

What are the land uses and general management practices of small lifestyle landholders?

Small lifestyle landholders land use and management practices are strongly influenced by their values and interests. Small lifestyle landholders undertake a diverse range of activities and land uses on their properties. These include small scale production systems, to keeping a collection of farm animals mainly as pets or growing a range of plants for personal use. They are likely to specialise in new and emerging industries. Many follow a model towards self-sufficiency and may not conduct any commercial activity. Their motivations for having animals and plants appear to be based around personal interests or hobbies, values and interests. Small lifestyle landholders also source and sell products in a variety of places including traditional markets. The exchange of products and animals across local communities and their personal networks is common practice.

What knowledge do small lifestyle landholders have about on-farm biosecurity risks and where to they get their information from?

Knowledge levels vary amongst different types of small lifestyle landholders. The study suggests small lifestyle landholders do not have adequate knowledge of pests and diseases or general on-farm biosecurity management risk that may impact on mainstream agriculture. Small lifestyle landholders source most of their land management information from friends, family and neighbours or from contacts within their special interest groups. Participation in small farm events appeared to be a catalyst for further learning and practice change. Most small lifestyle landholders perceive government agencies in a positive way but generally find it difficult to access the information they need. Small lifestyle landholders do not actively seek biosecurity information. It was apparent that small lifestyle landholders that had engaged in special small farm events that included biosecurity messages were likely to seek information and adopt new practices.

Small lifestyle landholders want and need biosecurity information. They highly value advice from other small landholder friends and neighbours and also government department information from people they feel confident with, that can resolve their issue and make 'farming' easier and more enjoyable. This could be explored in future research.

What are the potential risks posed by small lifestyle landholders to Australia's biosecurity?

Biosecurity and the small lifestyle landholder group is complex. Small lifestyle landholders appear to present a range of biosecurity risks associated with their land management practices, largely due to their lack of knowledge about, and awareness of animal and plant pests and diseases.

The nature of small lifestyle landholders poses potential biosecurity risks. Small lifestyle landholders form distinct network groups with other small lifestyle landholders and move, swap and share resources often in an unregulated market environment. Small lifestyle landholders access a wide range of outlets to source their stock. Similarly, there is a wide range of outlets where small landholders sell or trade animal and plant produce. Small lifestyle landholders belong to a range of special interest groups and source most of their land management information from friends and neighbours. The quality of this information is likely to vary.

Knowledge levels about animal and plant pests and diseases vary widely but small lifestyle landholders are willing to seek advice if they have a concern. Being a good landholder and farmer is important to them. Small lifestyle landholders are likely to report disease outbreaks (animal based) and pest incursions assuming they know what to look for and are motivated to report their observations.

6. Conclusion and recommendations

Small lifestyle landholders' knowledge about land management and their practices are likely to pose a risk to Australia's biosecurity. The location of small lifestyle landholders, their characteristics and information networks present opportunities and challenges to reduce this risk. Biosecurity risk is often not a conscience issue for most small lifestyle landholders. It is simply not on their radar. But as a collective these kinds of landholders appear to have a strong desire to manage land and livestock well, and be seen to be doing the right thing. Small lifestyle landholders are enthusiastic to learn and motivated to seek advice. This was also evident from stakeholder views about these kinds of landholders and the interviews with small lifestyle landholders. It was discovered that most small lifestyle landholders had low awareness of biosecurity and limited 'best practice' biosecurity strategies on their properties, but it can be argued that many other larger landholders with commercial enterprises and likely to be in this position too. Small lifestyle landholders may pose no greater biosecurity risk than any other segment of the population. The nature of small lifestyle landholders and their general orientation to aspire to be good land managers provides communication and extension opportunities to reduce potential biosecurity risk.

Small lifestyle landholders' social networks and interest groups also play an important role in biosecurity information and dissemination and may influence land management behaviour. Social responsibility and the notion of being seen to be "doing the right" also will have an influential role in communicating biosecurity messages and appropriate land and animal management practices to small lifestyle landholders.

Nevertheless, the link between biosecurity and land management attitudes and behaviour is complex. Attitudes to biosecurity have an emotional, cognitive and behavioural components intertwined within differing beliefs and intensity, including levels of compliance within social norms. In encouraging small lifestyle landholders to participate in biosecurity it is important to acknowledge that beliefs belong to the individual and are the knowledge base upon which attitudes are formed, whereas values can be viewed as more generalised aggregations of attitudes and beliefs that closely relate to people's priorities. For example, environmental values have been important in fostering awareness and actions associated with natural resource degradation and it is likely that small lifestyle landholder values of care and protection of landscape and livestock will be important in fostering awareness and actions associated with biosecurity. Intertwined with their environmental values, many small lifestyle landholders, particularly those seeking an alternative lifestyle, may be reluctant to use chemicals to control pests and diseases. Without appropriate alternatives, this has implications for biosecurity.

Still, the link between awareness, level of understanding and land management practice in the context of biosecurity risk within the small lifestyle landholder group remains a tenuous one. There is likely to be a range of factors which might influence any landholder's assessment of biosecurity risk and practices. Many underlying psychological processes relating to environmental perception, perceived self-interest, and the complexities of human decision making will influence biosecurity and land management. Social factors, such as attitudes and beliefs about specific land management practices and about broader biosecurity management, will undoubtedly influence adoption of specific practices.

With all land managers including small lifestyle land managers there is need to stress responsible land management and maintaining a 'good' biosecurity status. Sutinen and Keperan (1999) suggest that individuals tend to comply with the law to the extent that they perceive the law as appropriate and consistent with their internalised norms. Norms held by government for the protection of industry will not always align with the land managers norms of land management. Particular more so with small landholders as they are strongly driven of a rural idealised plan.

Overall, the study suggests that the social dimensions of small lifestyle landholders and capacity building programs are best addressed through the implementation of a participatory approach that involves a technical coaching role through the awareness, understanding, trial and adoption

continuum. In order to improve education and awareness of pest plants and animal disease there needs to be closer cooperation amongst government institutions responsible for delivering biosecurity services. The study recognises the need and advantages of a more local, state and national coherent, holistic approach to biosecurity. Targeting biosecurity messages to small lifestyle landholders will require an understanding of type of land use preferences and appeal to the values of land holder. Introductory biosecurity awareness information through to specialised topic specific information will be required. Extension approaches that are based on the instrumental model of communication and assume that a landholder's lack of information or technology is the main barrier to management change are likely to be ineffective. Small lifestyle landholders have reported they have access to a large amount of land management and in some cases biosecurity information, but struggle to make sense of it.

The changing nature of rural landholders and land use has implications for a wide range of government services and responsibilities. In terms of biosecurity, there has been relatively little focus on the significance of increasing numbers of small lifestyle landholders who do not rely on agricultural production for an income. Development of knowledge building resources frequently fails to take into account a social perspective. Most biosecurity information is about particular animal or plant pest or disease threats (biological characteristics, risk assessment, control methods), or issues of particular industry or ecosystems concern.

The study found that given the multiple and contradictory nature of identity amongst small lifestyle landholders, it makes no sense to develop a typology of this group of landholders in relation to biosecurity awareness and land management practice or categorise small lifestyle landholders in a particular group in order to improve biosecurity awareness or change their behaviour. A biosecurity risk approach to communication and activities that appeal to their value set is likely to be more useful.

Findings suggest that education strategies need to be focused on dealing with the individuals personal loss (for example, loss of animals that have an emotional attachment) and argues that there is also a need to educate the sector of the community on the implications of not reporting suspicious cases of diseased stock. Not all self-interests are selfish. There is opportunity to align communication messages with a need to educate the public on the implications of not reporting cases of diseased stock and tap into a sense of place-based community (Aslin & Mazur 2006; Barclay 2005). Education to this end needs to focus on raising the responsibility to create a personal responsibility of the individual to what could possibly happen in the case of a biosecurity outbreak and failure to report to the appropriate authorities. Biosecurity awareness campaigns would be more effective if the social impacts of a disease outbreak, particularly the emotional and financial losses that individuals could incur were emphasised.

Creating technical material for small landholders based on the above assumptions would raise the awareness of biosecurity within the sector as a starting point to facilitate on-farm practice change. However, for actual behaviour change, it may be more effective to frame biosecurity as a social change activity – focusing on an understanding of the actual behaviour of small landholders. There is a growing body of literature (Vanclay, 1995; Pretty 2002; Roling et al. 1998) that suggest understanding the social context of and providing informed policy increases the opportunity for on-ground practice change. For biosecurity communication to be more effective, extension programs and policies need to be informed through ongoing social research.

The study supports some of the social principles for extension in changing rural communities reported by Vanclay (2004). To reduce the potential biosecurity risks associated with small lifestyle landholders, biosecurity plans will need to take into account:

- Small lifestyle land ownership and management is a socio-cultural practice rather than a technical productivity activity. Profits are not the driving force for small lifestyle landholders.

- All small lifestyle landholders are not the same so it will be important not to stigmatise these kinds of landholders as participants in agricultural industry.
- Adoption of on- farm biosecurity strategies including surveillance is a social process.
- Small lifestyle landholders construct their own knowledge about land practice and science will not automatically have creditability and legitimacy.

The research has highlighted induced land use change associated with the emergent small lifestyle landholder group coupled with possible low knowledge levels of potential biosecurity risk increases the probability pest and disease transmission or disease outbreak which may devastate Australia's agricultural industries. Aside from this, there is also a need to promote biosecurity awareness and land management practice in the context of human health and family protection. Although demographic change, resulting in land-use change, may facilitate infectious disease emergence, the ecological effects of larger commercial farming landscapes may be criticised due to the potential effects they may have on disease outbreak and human health.

This project recommends:

- A national quantitative survey of small lifestyle landholders be undertaken to assess the magnitude of biosecurity risk associated with this rapidly growing sector to inform biosecurity efforts within Australia.
- Biosecurity awareness and capacity building programs be developed for small lifestyle landholders and their networks that focus on recognition, anticipation and management skills of pest and disease biosecurity risk including human health.
- A national coordinated program to improve the availability and accessibility of biosecurity information and advice be developed for small lifestyle landholders.
- Industry based biosecurity plans actively target small lifestyle landholders in a way that will appeal to their characteristics and values.
- The principles of good biosecurity practice are embedded into formal whole farm planning processes and checklists to raise awareness levels and influence property management decisions.
- Further research to assess biosecurity risk associated with the movement of animals and produce in unregulated markets and non compliance issues.

Appendix A

Semi-structure interview process and questions

- Introductions and purpose
- Explain the 2001 privacy framework and the anonymity of the data and reporting and seek permission to record the interview (interviewee to sign form).
- Reassure that there is no right or wrong answers; we are interested in your opinions.
- Time frame: Interview planned to last between 45- 60 minutes
- Record date, interviewee name(s), location, interviewer, record interview number.

Profile

1. How long have you owned your property?
2. Why did you buy your property?
3. a) Can you describe the farm activities on the property?
b) Why do you do these types of farm activities? e.g. for self-sufficiency, income, interest.
4. Do you have any contact with other small landholders?
If yes, please describe the type of contact you have.
5. a) Do you have any contact with your neighbours?
b) Are they small landholders or large commercial farmers?
If yes, please describe the type of contact you have.

Land use and practices

6. a) How many animals do you have?
b) What type of animals are they?
7. a) Do you usually separate any new animals from your existing stock when they first arrive?
b) If yes - How do you do this? How long to you isolate the stock for?
8. Can you tell us about any possible animal diseases that may affect your livestock?
9. How often do you check your livestock?
10. a) If you have a sick animals, what to do usually do?
b) When would you call in the vet?
11. Do you have any identification system for your stock (eg. NLIS)
12. a) How would you describe your livestock records? Please describe what you record.

- b) Do you ever buy in feed for any of your animals on the farm?
 - c) If yes, where would you typically source the feed?
- 13.
- a) Do you have poultry? – What types?
 - b) Can your birds come into contact with wild birds?
 - c) Are you aware of any diseases that can affect your birds?
 - d) If any of your birds died, would you report it.
- 14.
- a) Where do you sell/trade any produce/animal products produced on your land? Please describe.
 - b) How often do you sell or trade products from your property?
15. How do you manage weeds on your property? Please describe
16. Are you aware of the types of weeds you have on your property?
17. If you found usual new plant that you couldn't identify – what would you do?

Biosecurity

18. What is your understanding of the term biosecurity? Please describe what it means to you.
19. As a landholder, what do you see as your role in maintaining Australia's biosecurity?
20. Do you feel you have adequate knowledge of animal and plant pests and diseases relevant to your property?
21. Are there any specific pests and diseases that you are concerned about? Please describe.
- 22.
- a) Where do you go to source your land management information needs?
 - b) In your opinion how easy is it to get the information?
23. Have you ever received any information specifically about biosecurity? Please describe.

Other

Any other questions or comments you would like to make?

Do you know of any small lifestyle landholders, or others who have contact with small lifestyle landholders, who might be interested in participating in this research?

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