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report

knowledge for managing Australian landscapes

## Australia's farmers: past, present and future

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*Australia's farmers: past, present and future*

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- The many Australian farmers and members of farming families who, over the years, have shared their stories with my colleagues and myself. It is those stories that help us to understand the meaning behind the census numbers.

## Summary

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This report examines trends in the demographic structure of Australia's farmer population for the period 1976 to 2001.

After a long-term trend of declining farmer numbers through much of the 20<sup>th</sup> century, in the recent the past two intercensal periods (1991-2001) this decline has slowed and then almost stopped. Since 1981 the average farmer age has been steadily increasing. The average age of new entrants to farming has risen from 34 to 39.

The major factors contributing to these trends are:

- A decline in the number of teenage males entering farming. This decline manifested itself between 1986 and 1996. Teenage recruitment levels have not since recovered. Increased participation in education is the major contributing factor.
- Between 1981 and 1991 the number of men entering farming in their twenties declined by forty per cent. Entry rates have not since recovered. The rate of exit of young men from agriculture rose significantly in the 1980s and has remained high since. Poor returns in the cropping regions during the 1980s due to drought, high interest rates and low prices appear to be significant precipitating factors.
- Between 1971 and 2001 there has been a steady decline in the number of young women (aged 20-34) entering agriculture. Between 1996 and 2001 the number of these young women entering agriculture was seventy per cent less than the number entering between 1971 and 1976. This decline appears uninfluenced by the fluctuating fortunes of agricultural industries. Social factors underlying this decline appear to be the increasing participation of women in the workforce, in education and the delay of marriage until the late twenties or early thirties.
- Since the 1991 census the rate of exit of older farmers (aged over 60) has been slowly declining. Retirement is being delayed, possibly in response to the fewer numbers of younger persons seeking to take over family farms.

The declining entry of young persons into agriculture is both a response to pressures for agricultural restructuring that encourage some young persons not to begin a career in farming, and the attraction of competing opportunities available for the young elsewhere in society and the economy. The continued pressure on commercial farms to achieve greater productivity and the consequent need to increase business scale means declining farm numbers and farm aggregation are crucial for the continued competitiveness of most agricultural industries. The least socially stressful means of achieving these changes is to focus decisions to cease farming at the point of intergenerational transfer.

The countering attractive opportunities beyond agriculture are both economic and social. The strong growth of the non-farm economy produces many attractive opportunities for well-educated rural youth. The ageing of the Australian economy and the declining number of workforce entrants in the future will provide even greater opportunities for young persons to find rewarding occupations outside agriculture. Notable among the social opportunities is the greater ease of finding a partner in an urban environment compared with an isolated rural setting.

We should not expect these trends in the shedding of young from agriculture to be reversed in the foreseeable future. Modelling of the continuation of current behaviour suggests the increasing average age of farmers will peak between 2011 and 2015. Beyond this period there may be a small and gradual reduction in median farmer age as baby boomers leave farming. Farm populations will continue to decline in broadacre farming regions. In high amenity regions the future of the farm population is less clear, with evidence that farm populations have already begun to increase in some locations.

A number of social trends may have an impact upon these projections, but are beyond our capacity to model. These include new agricultural technologies, changes in the international energy supply system and new social behaviours arising from Australia's progression through the second demographic transition.

The report concludes by addressing a number of questions commonly asked about the future of the Australian farm sector. It concludes that generally there is no looming crisis, though the future farm population structure we are in transition towards will be quite different from that which existed some 20 years ago.

## Introduction

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In 2001 the National Land and Water Resources Audit and Land & Water Australia jointly released a report entitled "Structural Change in Australian Agriculture: Implications for Natural Resource Management". This report described the changing demographic composition of the Australian farm sector using data from the 1986, 1991 and 2001 Censuses of Population and Housing, and from Australian Agricultural Censuses conducted in the same years.

In its conclusion the report's authors argued that there was the potential for significant structural change within parts of rural Australia, and that this change may hold implications not only for natural resource management, but also for community well-being in these regions. It would therefore be wise to monitor the on-going structural change of rural Australia.

This new report is an investment by Land and Water Australia in the monitoring of demographic change in rural Australia. It utilises data from the most recent 2001 censuses of population and agriculture, together with archival data from the 1976, 1981, 1986, 1991 and 1996 censuses of population to extend the ten year span of the previous report into a twenty-five year time series. This not only provides descriptions of change in the most recent intercensal period of 1996-2001, but also places this new information within an extended historical context.

The report is structured into six sections.

1. A summary of the financial and seasonal conditions prevailing in Australian agriculture within the past five intercensal periods. This provides some background information helpful in interpreting the analysis of farmer adjustment behaviour.
2. An examination of the career choices of Australian farmers. In particular this explores decisions to enter and leave farming, and how these choices have changed the farmer population.
3. Modelling of potential future farmer populations to 2030, using our understanding of current entry and exit behaviour of farmers.
4. An exploration of the shortcomings of demographic modelling in the face of environmental, economic and cultural change in rural Australia.
5. Answers to some commonly asked questions about the changing demographic structure of rural Australia.
6. An exploration of the implications of the changing social structure of rural Australia for natural resource management.

In addition, two appendices are provided.

1. A description of the data sources and data entities used in the report.
2. A description of the regional agro-structural framework created in the previous report in this series and which was used in this report for regional analysis.

### Seasonal conditions and market prices

Commodity prices and seasonal conditions during the inter-censal period preceding each Population and Housing census will be one of the factors influencing demographic change in the agricultural sector. In the following section we briefly review the conditions that prevailed in each of the past six inter-censal periods.

**1971-76 and 1976-81:** It was in the 1970s that the agricultural sector had to respond to the loss of markets with Britain's entry into the European Economic Community. In this decade the dairy industry underwent massive restructuring, with many small dairy farms ceasing operation as dairy farms. The problems of the dairy industry were partly transferred to the high rainfall beef sector, with the conversion of many dairy farms to beef enterprises.

**1981-86:** The period leading up to the 1986 census was characterised by generally declining prices for cropping industries. The beef industry experienced an improvement in real prices. The middle of this period coincided with a severe el Nino event, which resulted in low rainfall or drought across much of eastern Australia. During the 12 months preceding the 1986 Agricultural Census rainfall was average across most of the Australian agricultural zone. Major rainfall deficits were experienced in central Australia, the Gulf country and coastal South Australia.

**1986-91:** The most obvious feature of this period was a major peak in wool and wine grape prices. Most cropping commodity prices showed little improvement over this inter-censal period. There was a significant decline in wheat prices and a significant rise in canola prices in the final year. Adjustment processes would reflect a period of stable prices in most cropping industries, beef, sheep meat and dairy industries. Adjustment processes in the wool industry would reflect an initial period of buoyancy, followed by the onset of low prices at the end of the inter-censal period. Climatic conditions were varied across Australia. During the first two years of the period low rainfall was experienced in south-western Australia, coastal Queensland, northern Tasmania and Gippsland. Central Queensland and the Eyre Peninsula experienced rainfall deficiencies in 1988. The 12 months preceding the 1991 census saw low rainfall in the Great Southern of West Australia and much of south-eastern Queensland.

**1991-96:** This inter-censal period was dominated by the period of prolonged low wool prices and a drought in the central NSW and southern Queensland cropping zone. Parts of the Darling Downs experienced only one year of average or above average rainfall in 1996. Rainfall deficits were also experienced in the Eyre Peninsula and much of coastal South Australia. The breaking of the Queensland drought and a rise in grain prices towards the end of this intercensal period increased farm family incomes well above that received during much of the inter-censal period. In contrast, wine grape prices rose significantly during the same period.

**1996-2001:** A weakening Australian dollar heralded improving conditions for many Australian farmers. The livestock industries commenced a gradual improvement in fortunes. The price of wool commenced a gradual rise with the final depletion of the stockpile, peaking in late 2002. Unlike the previous price spike, this peak was more pronounced in the broader wool types. During this period there was also a significant rise in the real price of beef and a more gradual but sustained rise in the price of sheep meat. The price of most major crops gradually fell throughout this period, with a gentle rally in the season immediately prior to the 2001 census. Wine grape prices peaked and then commenced a sharp price fall. The inter-censal period coincided with low rainfall for coastal Victoria and parts of south-eastern Queensland. In the year immediately preceding the 2001 census, these areas and south-western Australia experienced particularly low rainfall. With the exception of these areas, the season leading up to the census was characterised by rising incomes and confidence in broadacre agricultural industries. Some began to talk of this as a permanent return to good prices for Australian agriculture. Subsequent to the 2001 census, a rising Australian dollar has subdued this optimism.

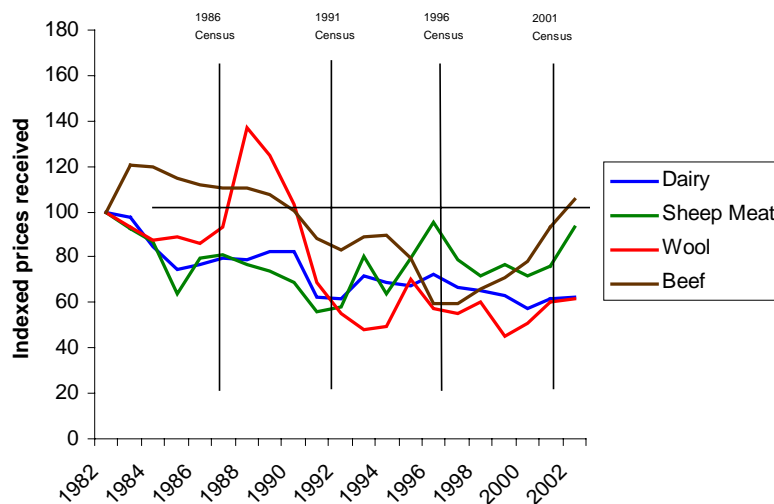


Figure 1 Indexed prices received by Australian farmers for major animal production commodities 1982-2002 (Indexed to 1982 = 100) and timing of Population and Housing Censuses (Source: ABARE)

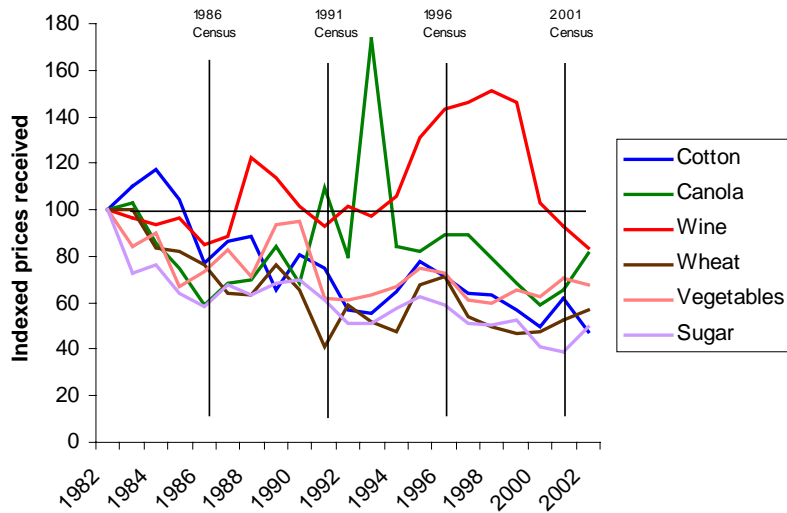


Figure 2 Indexed prices received by Australian farmers for major crop commodities 1982-2002 (indexed to 1982 = 100) and timing of Population and Housing Censuses (Source: ABARE)

### Farm Family Income

Farm family income is a reflection of the impact of commodity prices, farm structure, climatic and seasonal conditions, and non-farm income. Figure 3 displays an estimate of farm family income derived from ABARE farm survey data. This estimate is derived by combining ABARE's estimates of farm profit, imputed operator labour and off-farm income. The estimates have been adjusted for inflation so that the series is shown in 2001 dollars.

This data spans the past three intercensal periods from 1986 to 2001 and the cropping, dairy, beef and sheep industries. It clearly demonstrates the instability of farm household income, particularly the cropping sector. For the broadacre agricultural sectors depicted in the graph, the year leading up to the 2001 census was buoyant. The average family income of beef, dairy and sheep farming families was the highest recorded in a decade. It is incomes from this year that are reported in the 2001 census. We know that subsequent to this season, the rising value of the Australian dollar, low rainfall and a fall in the price of some commodities has reduced farm family incomes.

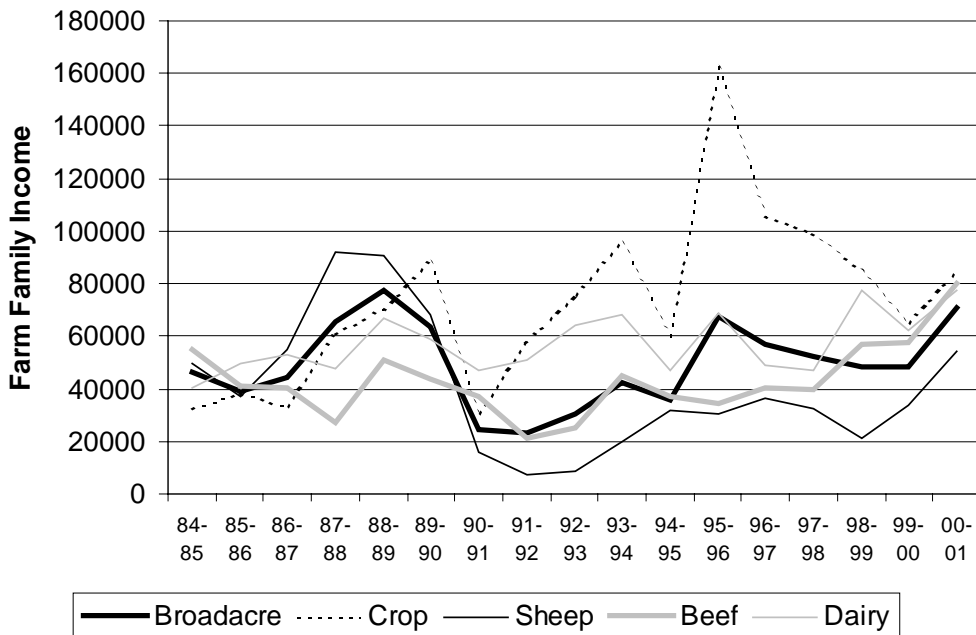


Figure 3 Farm family income (in 2001 dollars) for selected agricultural industries for 1985-2001 estimated from ABARE data

In Figure 4 we compare the distribution of Australian household incomes with Australian farm household incomes using income data from the 2001 Census of Population. In this relatively prosperous year there is a close similarity between the two household incomes of the two populations. The most obvious difference is in the low-income range. Here, the farm household population is over represented in the nil income range, and under represented in the \$100-\$400 range. These differences, together with a modest over representation of farm households in the highest income category, contribute to farm household median weekly income being \$75 higher than that of Australian households (\$860 as compared with \$785).

In making this comparison, it is notable that the past two population censuses have coincided with relatively prosperous years for Australian farmers. In 1996 the performance of the cropping sector in particular raised the median income of farm households. In 2001, cropping, dairy, beef and sheep sectors all contributed. This generally good performance across a number of sectors ensured that there were only a limited number of regions in the country with generally low farm household incomes (Figure 5). The most notable of these exceptions were the eastern wheat belt of western Australia and some irrigation regions in northern New South Wales. In both cases, low rainfall was the causal factor.

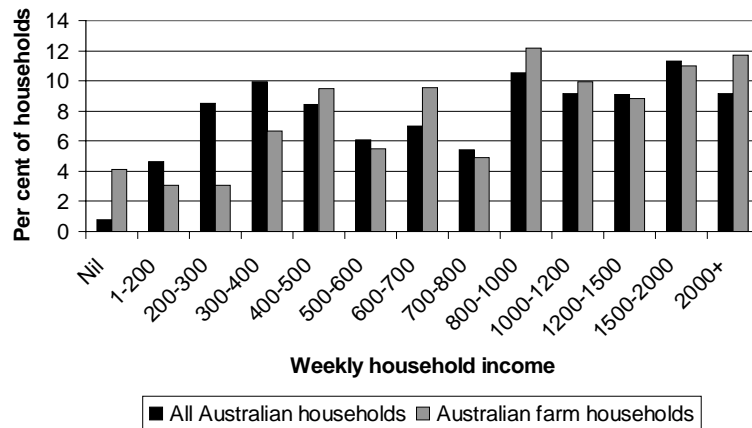


Figure 4 Household income distribution for Australian households and Australian farm households 2001 (source ABS Census of Population and Housing)

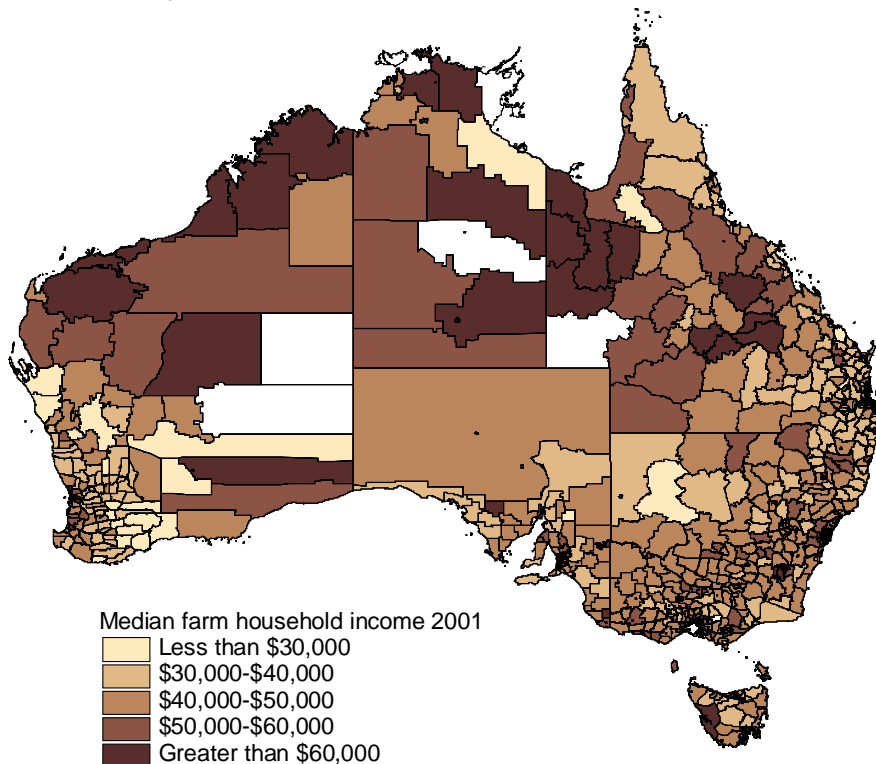


Figure 5 Median farm household income in 2001 (source ABS Census of Population and Housing)

## Has the decline of the Australian farm population halted?

A declining farm population has been the pattern of farm adjustment in Australia for many years. In the most recent census we are seeing evidence to encourage us to question whether future farm population decline is inevitable. During the inter-censal period 1996-2001 the number of farmers counted in the Census of Population and Housing declined at an annual rate of 0.44 per cent to a total of 194,719. This is the slowest decline in farmer numbers of any of the six inter-censal periods since 1976 and is one seventh of the rate of decline during the period between the 1986 and 1991 censuses.

Figure 6 compares changes in the counts of farmers, farm households and farm establishments using an index based on 1986 values equalling 100. The count of farm establishments is displayed in two separate series. The years 1976 to 1986 are based upon data that includes all establishments with an Estimated Value of Agricultural Operations greater than a nominal \$2,500. The series from 1986 to 2001 includes all farms producing an Estimated Value of Agricultural Operations greater than \$30,000 measured in 1996 dollars. Both these incomplete series are indexed to their 1986 values to provide some comparability.

There appear to be three periods exhibiting quite different trends.

- Between 1976 and 1986 the number of farmers and farm households declined by about four and a half per cent per intercensal period. Establishment numbers declined at a slower three per cent per intercensal period.
- Between 1986 and 1991 the rate of decline of each of each series increased markedly. The count of farmers fell by over 15 per cent in this inter-censal period and was greater than the decline in the number of establishments.
- Between 1991 and 2001 the rate of decline in the count of farmer and farm households has slowed. In the most recent intercensal period the number of farmers has hardly fallen, and the number of farm households has slightly increased. There has been no change in the rate of decline in the establishment count.

The mismatch between the decline of establishment and farmer counts in the most recent intercensal period is potentially explained by changes in the administration of the Agricultural Census. Prior to 1997 the Agricultural Census population frame was maintained through questions on the annually administered census form. In 2001 the Agricultural Census was undertaken after a four-year break. The population frame was significantly degraded and a new population frame was built using Tax Office records. The 1996 and 2001 counts of farm establishments may not be fully comparable.

Putting this factor aside, it is still apparent that over the period 1986 to 2001 there may have been a significant change in the pattern of structural adjustment in the Australian farm population. The career choices of the farmers of 2001 may be substantially changed from those of their predecessors. In the following section of the report we explore the nature of these changes in greater detail.

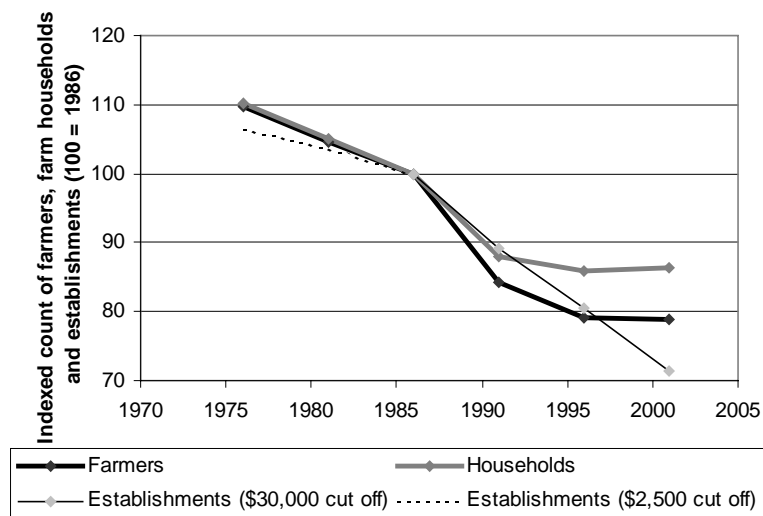


Figure 6 Count of establishments, farmers and farm households 1976-2001 (indexed to 1986 = 100)

## Entering farming

To understand the trends in Figure 6 we need to explore the decisions farmers are making to enter or exit farming. Entry to farming is one of the major adjustment actions that have an impact upon the demographic structure of Australian agriculture. The decision of a new generation to enter or not enter agriculture has a major impact on the restructuring of agricultural holdings, either initiating investment in farm build up, or alternatively signalling the possibility of land sale with the current farming generation's retirement from agriculture. Entry to agriculture is also seen as a source of significant new skills and capital to agriculture.

We have estimated a measure of entry to farming using census migration questions. Respondents to the census are asked whether their usual address has changed since the last census. Most of those who report living at a new address and who described their main occupation as farming can be assumed to be new entrants to farming. Further details on this method and its limitations can be found in Barr (2004b).

First we consider the age at which men and women enter farming. Figure 7 portrays the median age of entrants to farming between 1976 and 2001.

- There are two clearly distinct periods apparent in this graph. The median age of new male entrants remained steady at 33 years between 1976 and 1986. In the decade between 1986 and 1996 the median age of entry then rose to 37 years. In the most recent intercensal period the rise continued, but at a slower rate, reaching 38 years.
- The median age of entry of women has been consistently higher than that of male entry and the difference has been increasing. In 1976 the median age of female entry was 35, two years greater than that of males. By 2001 the median female age of entry had reached 43 years, five greater than the entry age of males.

Figure 8 shows the age distribution of entrants to farming for each census from 1976 to 2001. It is noteworthy that there has been little change in the number of new entrants in age groups aged older than 40 years of age. Amongst the younger age group there are three clear factors contributing to the increasing median age of entrants.

- A halving in the number of male teenage entrants between 1986 and 1996.
- A halving in the number of twenty year old entrants between 1981 and 1991.
- A lesser decline in the number of thirty year old entrants between 1981 and 1991.

In the next three sections we examine these phenomena in greater detail.

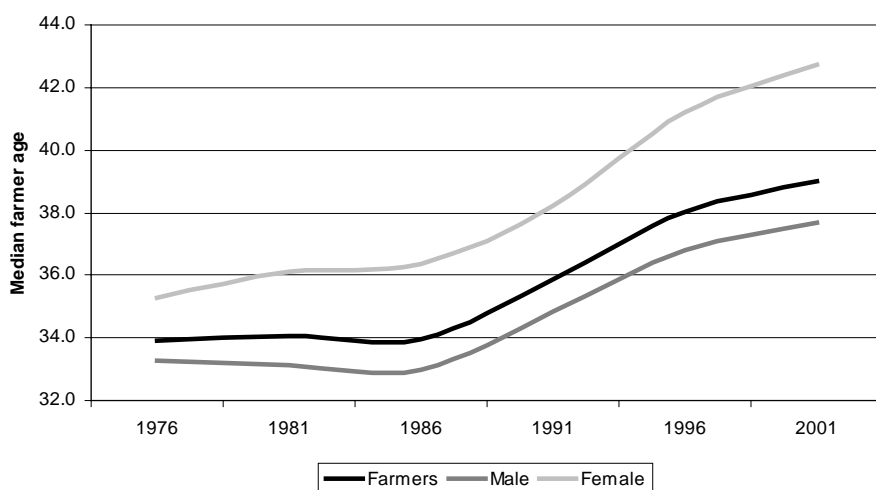


Figure 7 Median age of male and female entrants to farming 1976-2001

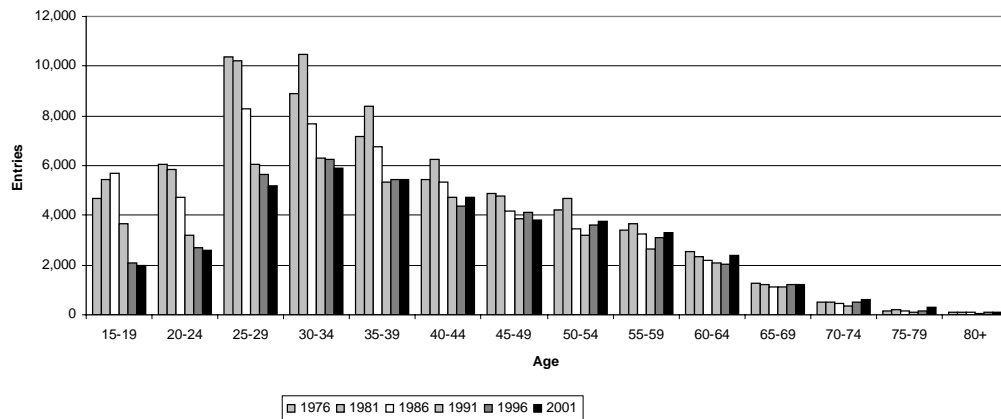


Figure 8 Estimated number of entries to Australian farming by age: 1971-76 to 1996-2001

### The teenage male: from farming to education

A generation ago the traditional path of entry to farming was the unofficial father to son apprenticeship. The apprentice was generally a young man, and often a teenager. In 1976 ninety per cent of teenage farmers were male. Between 1976 and 2001 the number of teenage farmers has fallen from 4,664 to 1,985. Figure 9 shows that the decline in the count of teenage farmers has mainly occurred in the cropping zone. In 1976 teenage farmers comprised more than two per cent of the farmer population in many cropping zone SLAs. Teenage farmers were already a rarity in the higher rainfall grazing zone. By 2001 there were very few SLAs where the teenage farmer population comprised two per cent or greater of the farmer population.

The decline in entry of teenagers to agriculture need not be a cause for concern. In this trend farming mirrors trends in workforce participation outside agriculture. During the late 1980s and early 1990s there was a general decline in the workforce participation of teenagers and an increased participation in education (Hugo 1998). Entry to the workforce was delayed until after a longer period of education. Today entry to farming is more likely to occur in later years after education, significant workforce experience and the accumulation of capital (Stayner 1997a).

### Fewer young men are entering agriculture

Since 1976 the number of farmers aged in their 20s entering farming has more than halved. Most of this decline occurred in the 1980s (Figure 10). Since the 1990s a new low level of entry by 20 year olds has been maintained.

Only a small part of this entry decline can be attributed to increased participation in education. Most young men have finished their education by their early twenties. A more likely reason that has been advanced is a lessening of interest of younger persons in agriculture. Research commissioned by the National Farmers' Federation has previously documented a decline in the interest of young persons in entering a career in agriculture (Ferguson & Simpson 1995). A case study survey in the Goulburn-Broken catchment of Victoria reveal parts of the landscape where expectations of inter-generational transfer have been almost non-existent (Curtis et al. 2000b). This trend is also a reflection of the difficulties of entering farming for the younger aspirant. The potential career in farming is often seen as being beset by poor returns, the need for significant capital and by the difficulties of working in a family environment with poor lines of communication (Stayner 1997a). In contrast, younger rural residents will often perceive greater opportunities elsewhere in the modern economy as well as an improved quality of social life in regional centres or the metropolis. The concentration of this decline in the decade of the 1980s suggests the prevailing high interest rates and poor returns to the cropping industries in this period may be an important catalysing factor. Figure 11 shows Statistical Local Areas with the highest rates of decline in entry by 20-year-old males. The cropping regions of Australia are prominently represented.

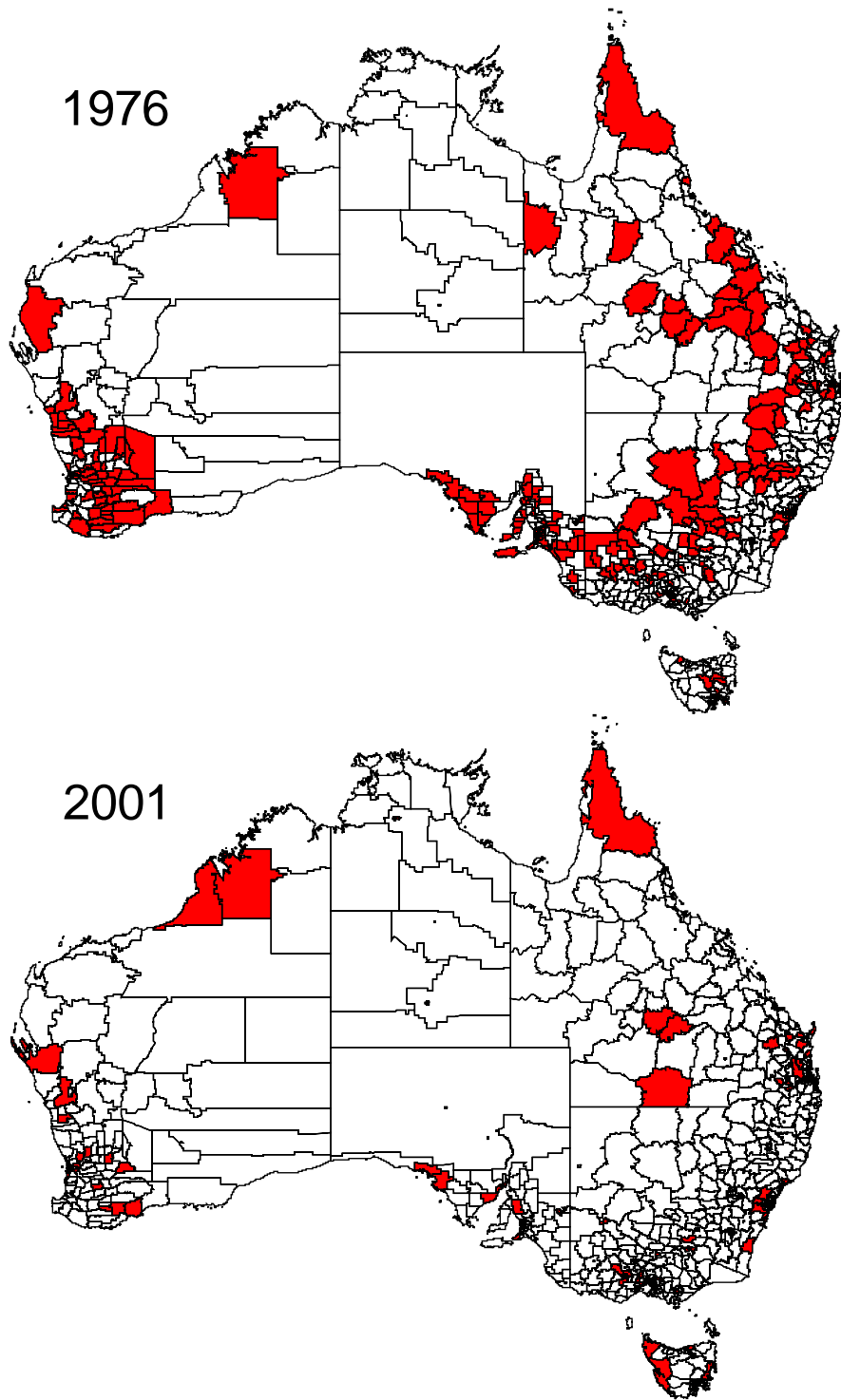


Figure 9 SLAs in which teenage farmers comprised greater than 2 per cent of the farm population 1976 and 2001

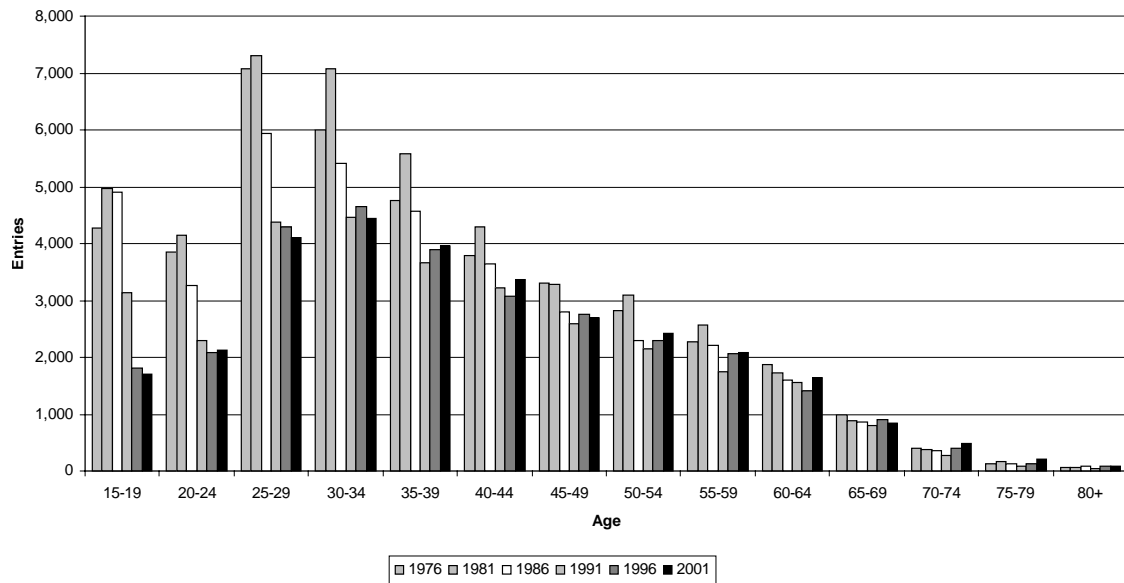


Figure 10 Count of male entries into farming by age 1976-2001

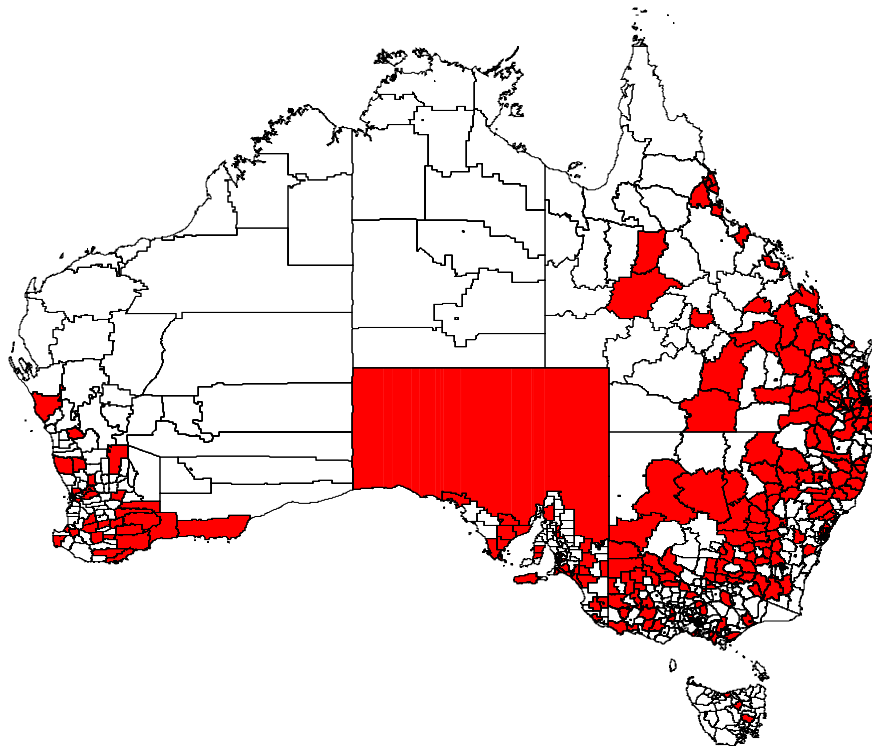


Figure 11 SLAs experiencing a decline in 20-29 year old male entry greater than 30 per cent between 1981 and 1991

### Young women, education and later marriage

Whilst the number of young men entering agriculture has declined by 40 per cent over the past 25 years, this decline is modest in comparison with the decline in the entry of young women. Since 1976 the number of young women in their early 20s entering agriculture has declined by eighty per cent (Figure 12). The decline is almost as great for women in their late 20s. The rate of decline in entries of women is approximately double that of men for all five-year age cohorts between 20 and 45.

There is evidence that the factors behind the decline in female entry are different to those explaining the decline in male entry. Figure 13 shows the number of female entries to farming in each intercensal period between 1976 and 2001. Entry of twenty-year-old women has been declining steadily with each successive

census since 1976. This contrasts with the concentration of male decline during the 1980s (Figure 10). Traditionally, many women have entered agriculture through marriage. In 1976 the average age of first marriage was in the early 20s. The average age of first marriage in Australia is now approaching 30. It is clear that in the period between education and marriage, when most young women are now establishing a career, those rural-born women who may once have been destined to marry farmers are now migrating to urban locations following education and career opportunities. Many are encountering their future partners there, rather than in their rural birthplace. The result is a growing mismatch in the sex balance of single young persons in traditional farming landscapes. Those who do marry into a farm partnership are increasingly likely to bring with them their own career outside agriculture. Thus, though they may be entering farming households, they will not be entering farming as their main occupation.

Figure 14 shows those SLAs with 10 or more female farmers aged 20-29 in 1981 and in 2001. In 1981 most rural SLAs had ten or more female farmers aged 20-29. The exceptions were the rangelands and the higher rainfall SLAs dominated by the beef industry. By 2001 very few SLAs met this criteria. These few included a number of SLAs associated with dairying or irrigated agriculture and with high farmer counts. Their higher counts of young women may merely reflect the large number of farmers in these SLAs.

Figure 15 show SLAs with at least 15 female farmers and in which a quarter of female farmers are aged under 30 in 1981 and 2001. The changes between 1981 and 2001 in this map are almost as striking as in the previous map. In all states except Queensland and Tasmania, the count of SLAs meeting this criterion has fallen sharply. In the south the change is most acute in the wheatbelt, the area from which education and career advancement is most likely to require out-migration due to the undiversified local economy.

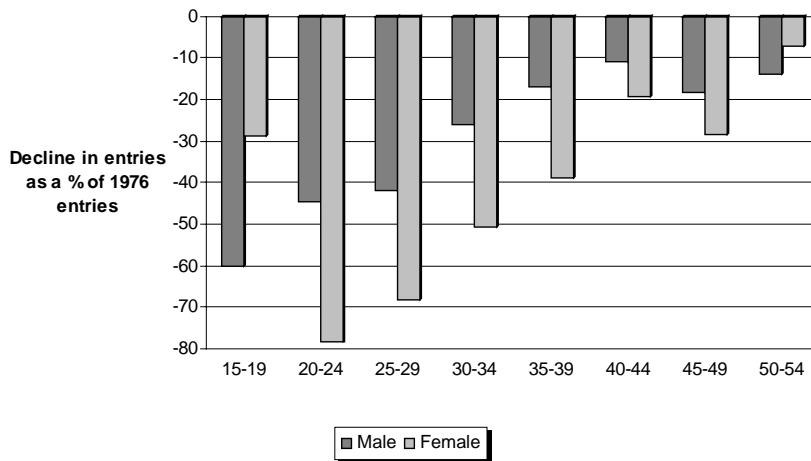


Figure 12 Entry to farming by age and sex 1976 and 2001

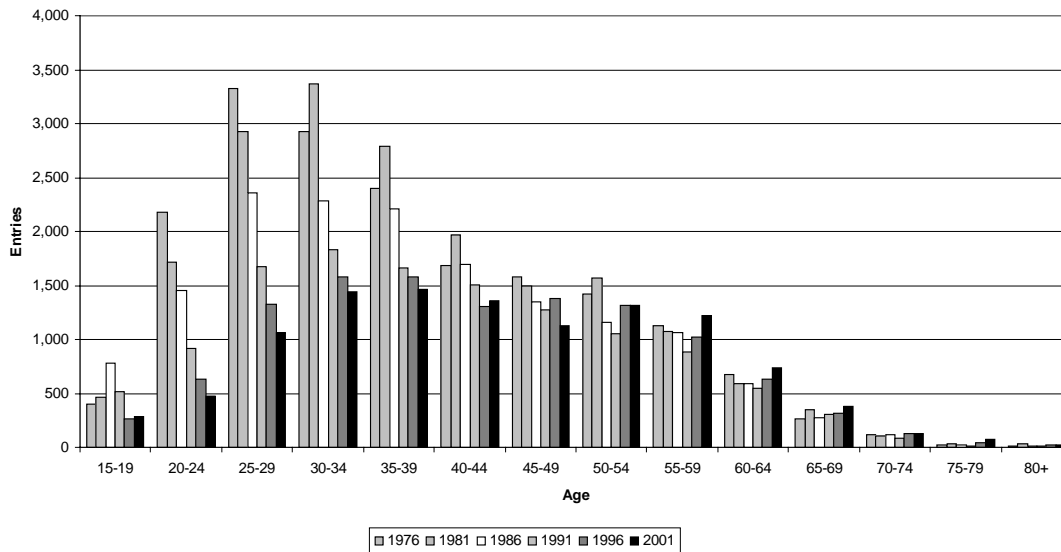


Figure 13 Female entries to agriculture by age 1976 -2001

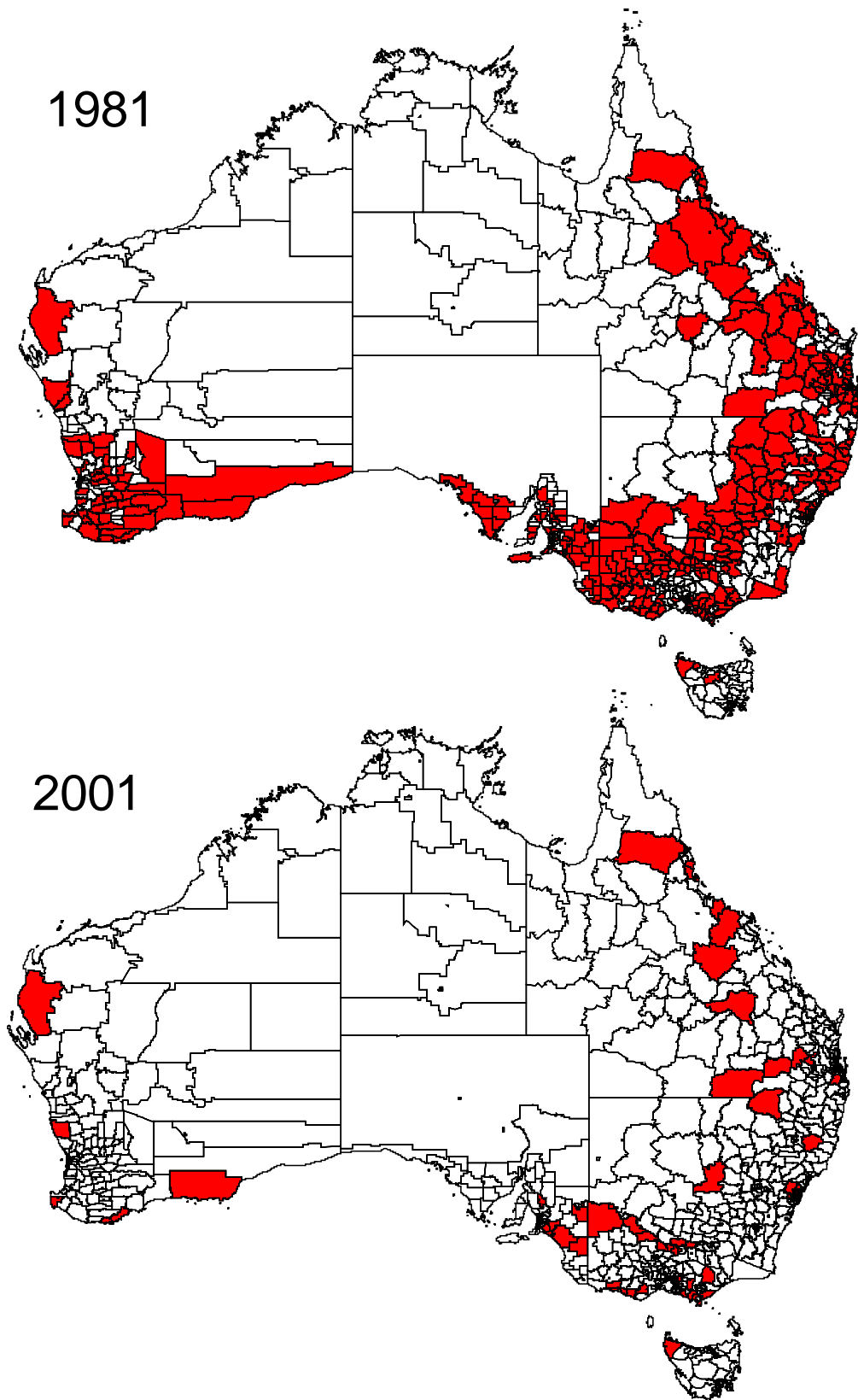


Figure 14 SLAs with ten or more female farmers aged 20-29 1981 and 2001

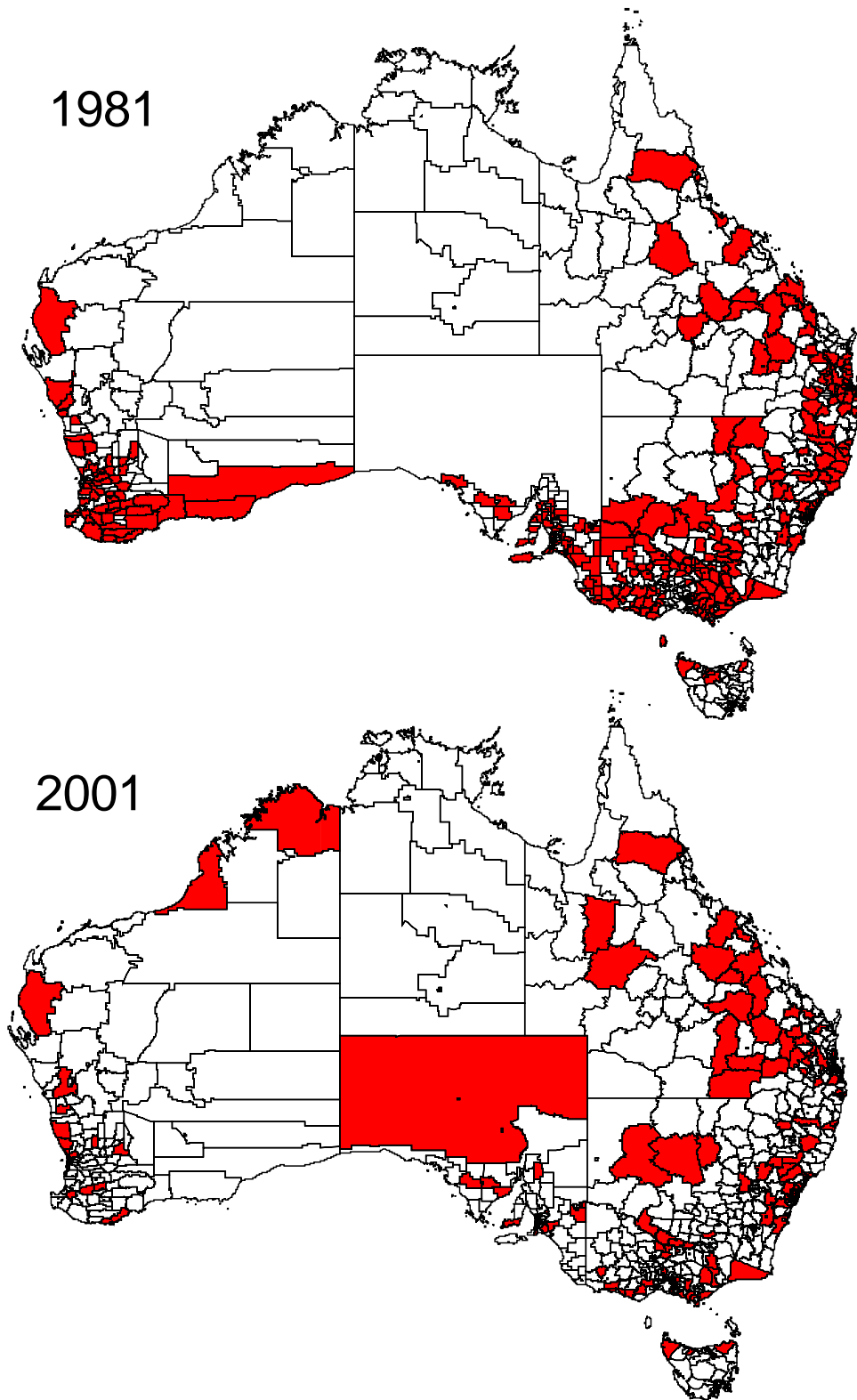


Figure 15 SLAs in which female farmers aged 20-29 comprised 25 per cent or greater of the total female farmer population 1981 and 2001

## Exiting farming

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The decision to exit farming has been a sporadic focus of agricultural policy in previous decades. Encouraging farmers to voluntarily leave farming has been seen as one strategy to assist Australian agriculture adjust to declining terms of trade and a preponderance of small farms in some Australian landscapes. These policies have generally had little impact.

It is not possible to use of data from the Australian Bureau of Statistics Population and Housing Census to directly count the number of persons exiting farming. There is no means of identifying persons who described themselves as farmers in the previous census and who now are coded into another occupational category. We again used a proxy measure of exit rates calculated from the change in number of persons calling themselves farmers between successive censuses and the number of in-migrants who identified themselves as farmers.

$$Ne(t) = F(t) - F(t-5) - N(t)$$

where

$Ne(t)$  = number of farmers exiting farming between year (t-5) and year t

$F(t)$  = number of persons describing themselves as farmers in the census of year t

$F(t-5)$  = number of persons describing themselves as farmers in the census preceding year t

$N(t)$  = Number of persons describing themselves as farmers who changed addresses between year t and year t-5.

This indicator was used in the previous report in this series (Barr 2001). Further details of this measure and its limitations are discussed in greater detail in an associated report (Barr 2004a). A similar technique has been used to calculate exit rates in US agriculture (Gale 2003b).

The greatest shortcoming of this indicator is the inability to detect persons shifting between full-time and part time farming status. Figure 16 portrays changes in average farm family off-farm income since 1984-85. Off-farm income has been rising gradually in the crop, beef and sheep sectors. Of particular note is the increase in sheep farm family off-farm income in the mid 1990s, followed by a decline in off-farm income in the most recent intercensal period. One explanation is that a significant number of farmers may have taken off-farm employment in the early 1990s and have since left these jobs as wool prices have risen modestly and farmers have aged. This phenomenon will reduce our estimated count of exits in the same intercensal period. This has been observed in analysis of sheep industry data for Victoria (Barr, Wilkinson, & Karunaratne 2002). However, there is no strong reason to expect a significant impact for exit rates from other industries. Because of these shortcomings, estimates of exit rates from this measure must be treated with caution and used for relative comparisons rather than as actual measures.

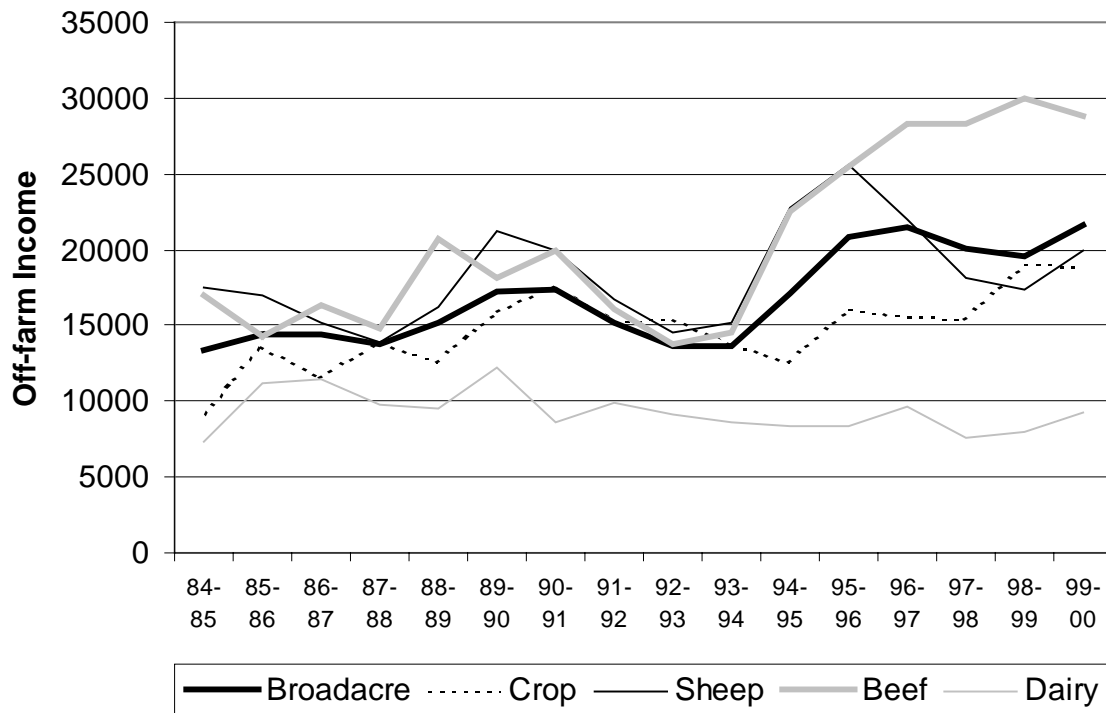


Figure 16 Off-farm income of Australian farm households by broadacre sector 1985-2001 expressed in 2001 dollars (source ABARE data)

### Recent exit rate trends

An analysis of the aggregate rate of exits depicts a very stable pattern of exits between 1976 and 2001. The rate of exit of male farmers has remained around five per cent per annum with the exception of the 1986-91 inter-censal period when the exit rate rose six and a half per cent (Figure 17). In Figure 18 the median age of persons exiting farming is shown. In 1976 the median age of exit was 58 years. The median exit age fell over the next decade to below 55 years, and has since risen again to approach 58 years in the most recent two censuses.



Figure 17 Rate of exit from farming by sex 1976-81 to 1996-2001

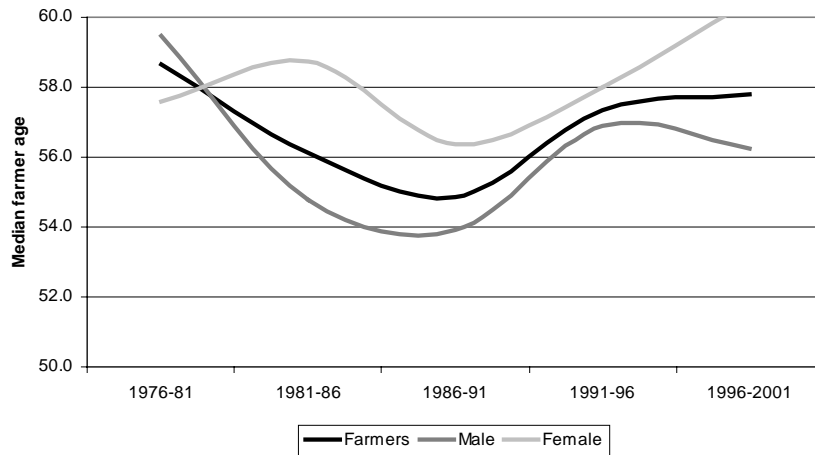


Figure 18 Median age of persons exiting farming 1976-81 to 1996-2001

On a simple glance these two representations suggest that during the 1986-91 inter-censal period the exit behaviour of Australian farmers was unusual, but that since this period behaviour patterns in the 1990s have returned to those observed in the decade prior to 1986. This simple interpretation is not correct. A more detailed review of exit behaviour changes in different age groups reveals some quite different processes whose impact is masked by aggregate analysis.

Figure 19 shows the rate of exit from farming by age for each inter-censal period between 1976 and 2001. There is a clear U-shaped relationship between age and exit rate. Exit rates are high for the young, then decrease with age from 25 years until 40 years. The age of lowest exit rates is from 40 to 50. After 50, the rate of exit gradually increases to an annual rate of 13 per cent for farmers aged over 80.

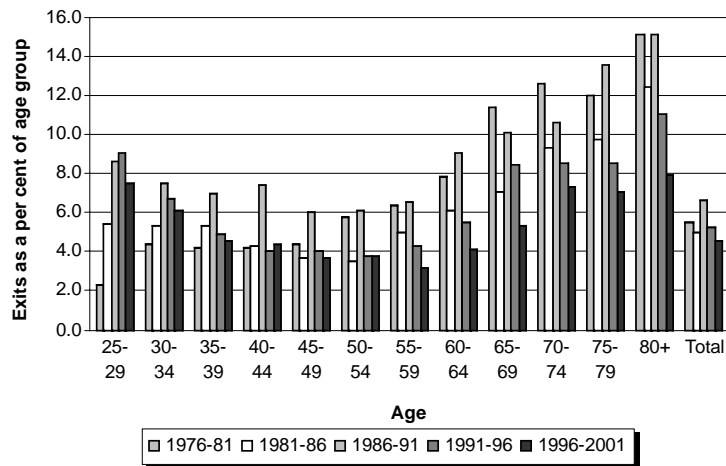


Figure 19 Exits from farming as a per cent of age cohort population 1976-81 to 1996-2001

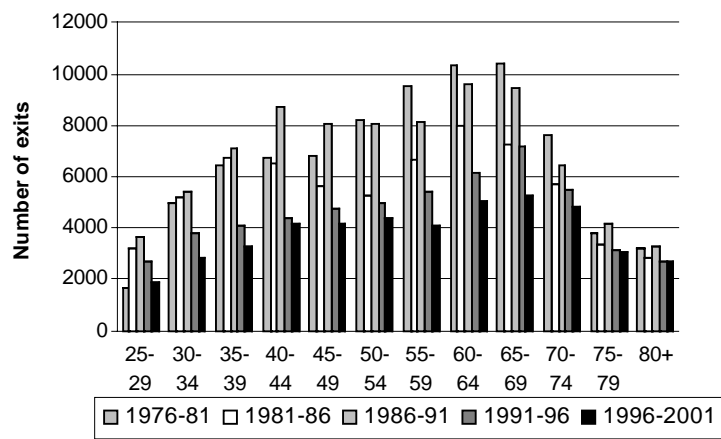


Figure 20 Exits from farming 1976–81 to 1996–2001

High exit rates among younger farmers are an indication of the relative career mobility of youth and the higher returns available to the young from career change. These are the years of both vocational development and relationship formation. Both these needs, together with perceived limited agricultural career prospects, may be a major driver of these decisions to exit farming.

The rate of exit from farming is lowest in the ages where there is greatest likelihood of dependent children being part of the family unit. It is probable that at this stage the relatively few exits from farming are more likely to be an outcome of marital relationship breakdown than responses to economic signals within agriculture. This is the major cause of farm exits. In a study of the decision to exit farming in northern Victoria, spouse satisfaction with marriage and family life was found to be the best indicator of future exit decisions (Barr 1999). Exits for ages 60 to 70 are likely to be motivated by retirement and successional strategies. Finally, as age increases, health and frailty are likely to become greater drivers of exit decisions.

Within this general pattern, there have been some interesting shifts in behaviour since 1976.

- In the 1980s the rate of exit of younger farmers (aged under 35) rose sharply. For farmers aged 25 to 29 the rate of exit almost quadrupled. Since the 1980s the rate of exit of younger persons has remained at this new higher level. This is the cause of the decline in median exit age during this period. The 1980s were clearly a watershed in the involvement of younger persons in agriculture. It was in the 80s that the entry rate of young men also fell sharply
- In the period 1986-1991 there was a transitory spike in the rate of exit of mid-career farmers (35-64 years of age). This accounts for the spike in the average exit rate in this intercensal period.
- In the 1990s the rate of exit of older farmers (aged over 60) has been falling. Farmers are retiring later. This appears to be counterbalancing the continued higher rates of exits of younger farmers, causing the median age of exit to again rise towards 58 years of age.

In the following three sections we look at each of these phenomena in turn.

### The increased exit rates for younger farmers in the 1980s

It should be no surprise that the increased rate of exit of persons aged 20-29 is mainly a phenomenon involving young men. Between 1981 and 1991 the number of young men aged 25-29 leaving agriculture over a 5 year period rose from 2000 to 3620. This represents an exit rate rising from three per cent to ten per cent (in the same period the base number of young farmers has been declining). The number of similarly aged young women leaving agriculture rose to 230 and an exit rate of a little over three per cent. In this period young women were not exiting agriculture because they were not choosing to enter it in the first place. This is further evidence that the 1980s saw a significant decline in the attractiveness of farming to young men. The reasons have been speculated upon in an earlier section.

### The mid career exit rate spike of 1986-91

The transitory increase in the rate of exit from farming between 1986 and 1991 is quite different from the other demographic trends discussed in this report. Its uniqueness lies in its transitory nature. Decreasing recruitment of the young, increased exits of the young and slowing rates of retirement, all appear on the

available data to represent permanent shifts in the behaviour of the Australian farm population. The exit spike between the 1986 and 1991 censuses has not been repeated, suggesting the possibility this may be a measurement aberration.

The spike in exits is most apparent for men, and in particular for men aged between 40 and 55 years of age (Figure 22). For women, the spike is less apparent, but is still most obvious in the same age group. Given the age group 40-54 has a high proportion of the total farmer population, changes in the exit behaviour of this group have a large impact on overall measures of exit behaviour.

Figure 23 shows the spatial variation in this exit spike. The increase in the exit rate was observed in most farming SLAs across Australia, though the increase was greatest in the more isolated SLAs such as the rangelands and the eastern wheat belt of Western Australia.

Numerous explanations for this phenomenon may be speculated upon, but few are fully consistent with the patterns of the data. This period coincided with the temporary boom in wool prices prior to the demise of the wool industries Reserve Price Scheme. It has been generally found that exits from agriculture increase during buoyant times when the land market is optimistic and prices rises. This was certainly observed in this period in Victoria. High wool prices encouraged higher land values and increasing numbers of properties changing hand (Barr, Wilkinson, & Karunaratne 2002). However, the increasing exit rates were not confined to wool producing areas (Figure 23). This period also coincided with a move to greater levels of off-farm work. However, the highest rise in exit rates was in the more isolated areas where opportunities for off-farm work are limited. On the available evidence, we must admit this particular phenomenon cannot be easily explained.

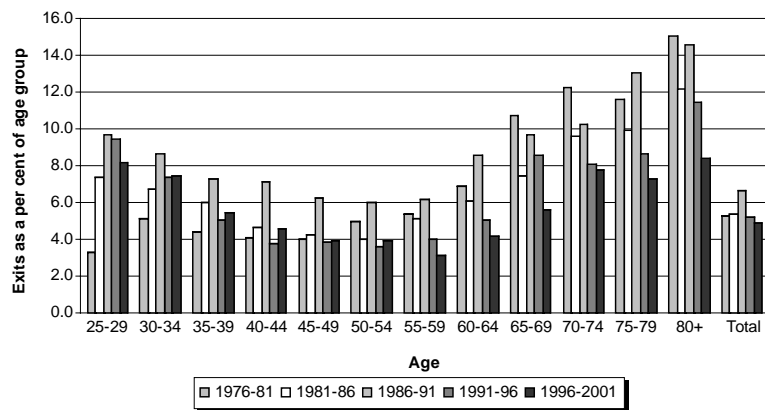


Figure 21 Male exit rate from farming by age 1976-2001

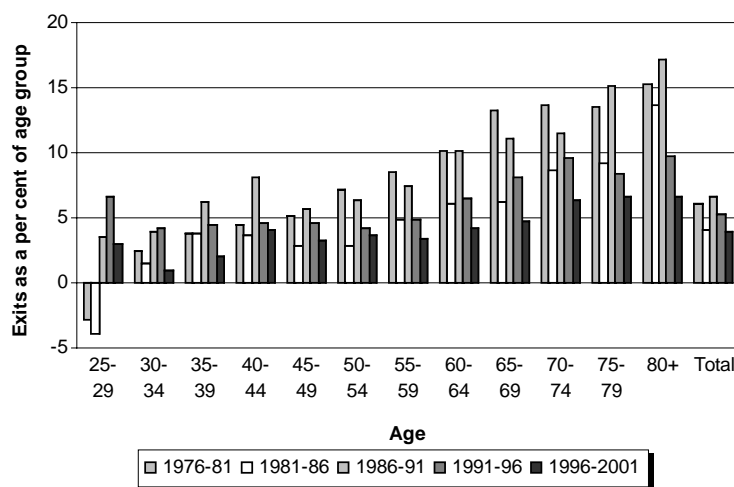
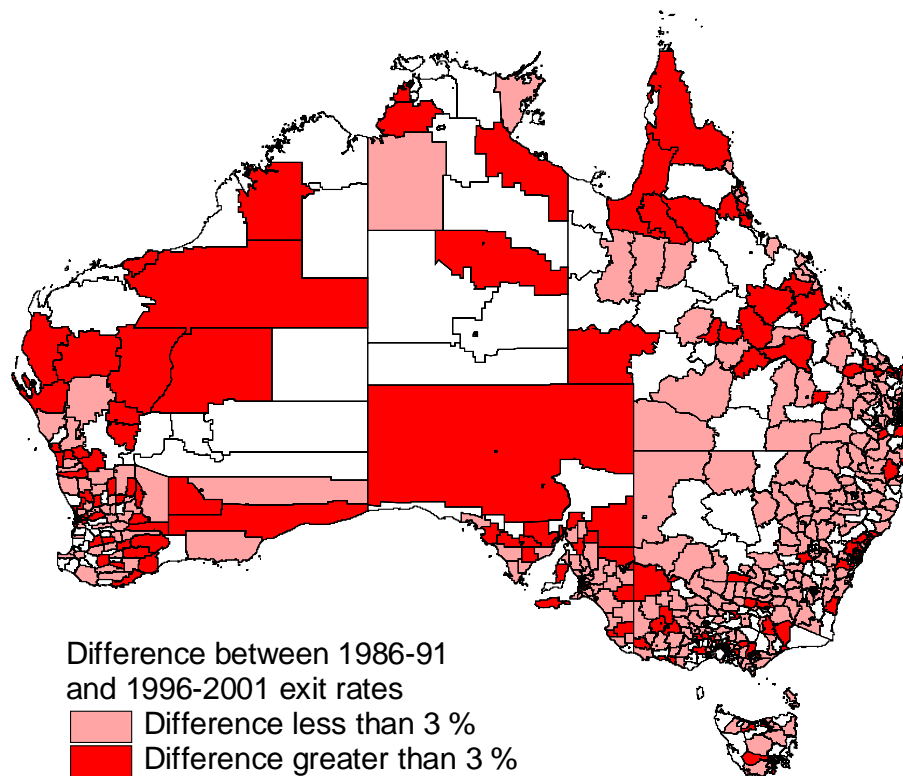


Figure 22 Female exit rate from farming by age 1976-2001



*Figure 23 Exit rate in 1991 relative to exit rate in 1996 by Statistical Local Area*

### **Delayed retirement in the 1990s**

The final demographic trend to explore is the more recent decline in the rate of exit or retirement of older farmers. A review of Figure 22 reveals that the decline in exit rates amongst older farmers is seen in both males and females. For the 60 to 64 year age group, exit rates have more than halved for both sexes over the decade of the 1990s.

Figure 24 shows SLAs with exit rates greater than seven per cent for 60 to 69 year olds in 1991 and 2001. Much of northern Australia is excluded due to the low numbers of older farmers, making exit rate estimations unreliable. In 1991 exit rates greater than seven per cent amongst these older farmers appear to have been the norm in all except the beef production landscapes along the Great Dividing Range. Here lower rates of retirement were already part of the culture of the high rainfall beef industry. By 2001 the number of SLAs meeting this exit rate criteria has shrunk dramatically. The small number of SLAs with exit rates for 60 year old exceeding seven per cent appear to be associated with the dairy industry or horticulture in south-eastern Australia. The decline in exit rates is less pronounced in the west of Australia.

The reasons for this changed pattern of retirement must remain speculative in the absence of more detailed research. In Victoria a recent qualitative study of wool industry retirement strategies has found the lack of clear inter-generational succession is an important factor in delayed farm retirement (Wilkinson 2003). In contrast, the dairy industry has a well-established tradition of retirement from farming, reflecting the nature of the lifestyle. Further research is needed to better understand this trend to later retirement.

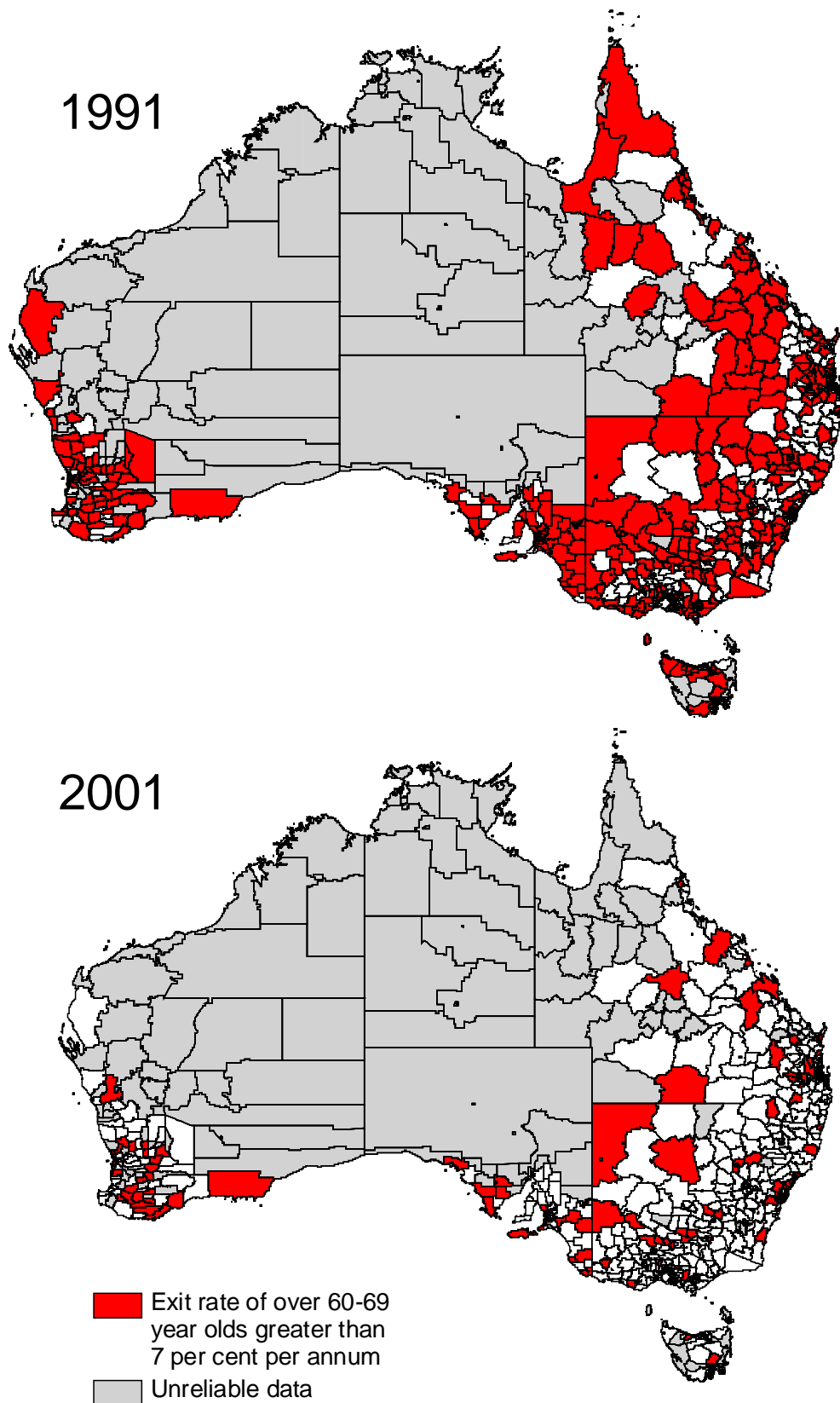


Figure 24 SLAs in which the estimated annual exit rate from farming amongst 60-69 year olds is greater than 7 per cent for the periods 1986-1991 and 1996-2001

## The new population structure of Australia's farm sector

The changed entry and exit behaviours described in the previous sections have reshaped the demographic structure of the Australian farm sector. This reshaping is shown in the striking differences between the age profile of Australia's farm sector in 1976 and in 2001 (Figure 25). The structure has changed from a relatively flat profile with a broad peak between the ages of 30 and 55, to a profile with a more pronounced peak between 45 and 60 years. The median farmer age has been steadily rising, from a low of 44 years in 1981 to a little over 50 in 2001 (**Error! Reference source not found.**). The obvious questions that arise are "How long will this ageing continue?" and "When will the demographic structure of the Australian farm sector stabilise?". To answer these questions we must attempt to model the demographic behaviour of the farm sector. The following sections of the report how we have built our models, what the models tell us about the future Australian farm population, and the limitations of our models.

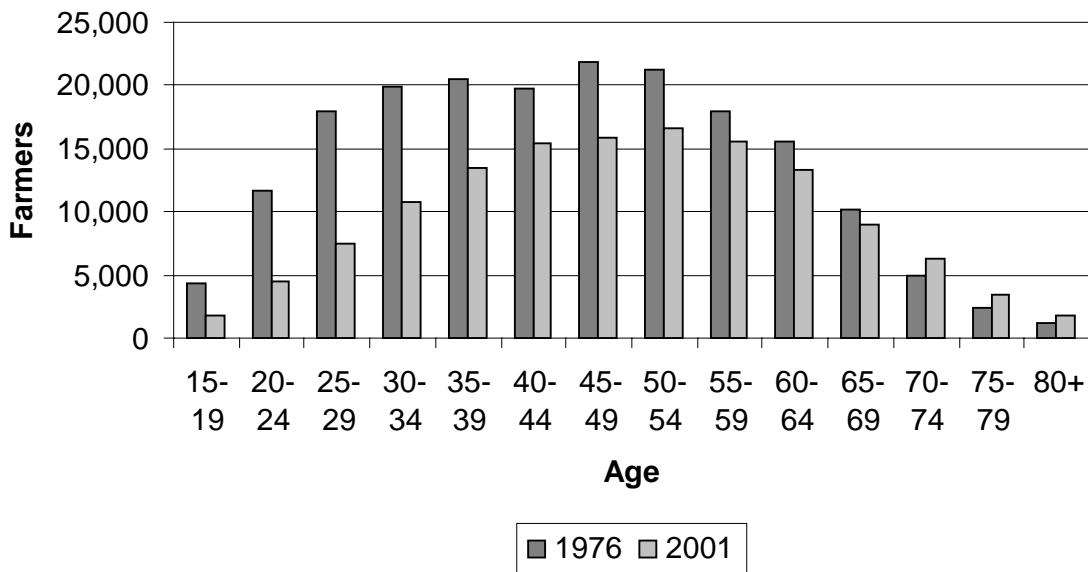


Figure 25 Age profile of the Australian farmer population 1976 and 2001

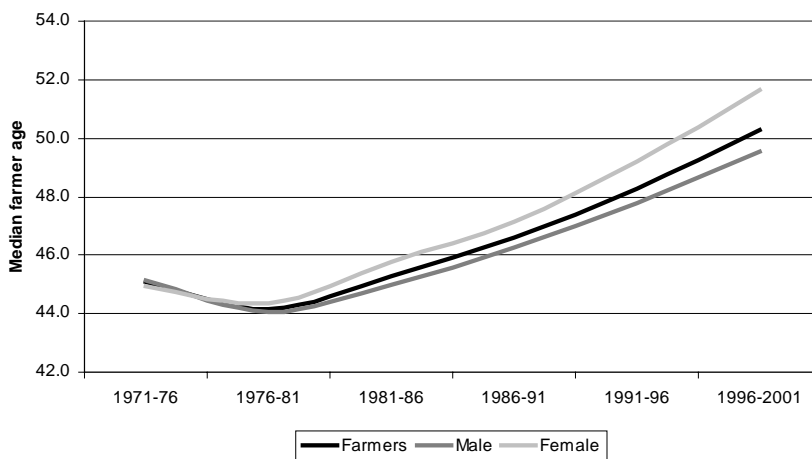


Figure 26 Median age of Australian farmers 1976-2001

## Modelling future Australian farmer populations

The preceding analysis allows us to refine the modelling of future farmer population undertaken in the previous report in this series (Barr 2002a). As before, we have used the measures of entry and exit from farming to build a simple model of demographic restructuring of Australian agriculture. This model is based upon observation of the tendency for decisions to leave farming to follow life cycle drivers, except in periods of great external change. In the 1960s, the US agricultural economist, Marion Clawson, succinctly summed up the place of family life cycle in these decisions.

*“men once fully committed to farming leave it reluctantly and slowly...[and] young men refuse to enter farming as long as income prospects are poor” (Clawson 1963)*

Clawson was explaining the basis for his use of demographic data to model future farm populations. In our own modelling we have drawn on the work of Clawson and other farm demographic researchers in the USA and Canada that has showed the patterns of exit for each age group remain relatively fixed over time (Tolley & Hjort 1963) (Kanel 1964) (Smith 1987) (Gale 1996) (Gale 2003a).

In our previous modelling we were limited to three data points from the 1986, 1991 and 1996 censuses with which to estimate the main parameters of the model. This ensured a high degree of uncertainty in discerning long term trends from short-term perturbations in age related entry and exit rates. We now have six data points that provide greater confidence in selecting model parameters.

The model remains a simple stock and flow structure (Figure 27). The key parameters so the model are:

- The rate of exit from farming for each age group from 20-24 to 80 years or greater, which is based upon historic exit rates for that age group.
- The number of entrants to farming in each five-year age group from 20-24 to 80 years or greater is calculated as a ratio of the number of farm exits in the same period. This is because entry to farming is not a function of the existing population of farmers. A more important factor is the number of farm properties available for purchase. If a greater number of properties are made available for purchase, then, given no change in the relative competitive position of new entrants and existing farmers in the land market, then there will be a greater number of new entrants.
- The number of teenage entrants to farming is calculated as a function of the number of farmers aged 40 to 54.

The model is calculated for Statistical Local Areas using parameters derived from historic farmer entry and exit behaviour displayed in each SLA. A more detailed description of the model may be found in a related report (Barr 2004b).

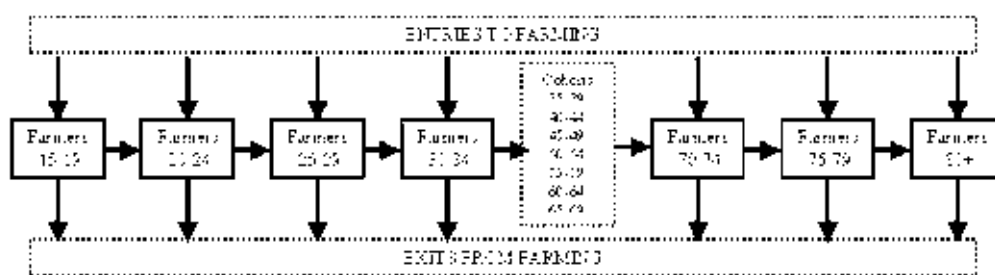


Figure 27 Adjustment model based upon 5-year age cohorts

### Operationalising the model

To operationalise this model we need to use estimates of exit and entry rates derived from previous intercensal periods. This leads to the question of whether these parameters are stable, and if not, whether they are subject to cyclical variation or longer-term changes in value. A number of important behaviour changes occurred in the 1980s and have continued in the intervening censuses. These include the decreases in entry rates of teenage males and men and women in their 20s and early 30s, as well as the increased exit rates of male farmers aged in their 20s. We have assumed these changes represent a shift to a new and permanent pattern of behaviour. In contrast, there are two behaviour shifts we feel are an open debate as to whether they

are temporary phenomena. One is the spike in exit rates in the period 1986-91. The other is the recent decrease in the exit rates of older farmers. Both of these phenomena merit further discussion.

The ratio of exits to farmer population is shown previously in Figure 17. With the exception of the 1986-91 intercensal period, the rate of exit from farming has ranged between 5.5 per cent and 4.5 per cent. Is the elevated rate for 1986-91 an aberration, or does it represent part of a cyclical phenomena? If the former, then using the exit rate for the most recent intercensal period is appropriate. If the latter, then an average over the past three intercensal period may be more appropriate. Use of 1996-2001 exit rate parameters assumes that both the increased exit rates of younger farmers that commenced in the 1980s and the more recent decrease in the exit rates of older farmers are permanent changes. The use of averaged exit rates for the past three intercensal periods only assumes the increased rate of exit of younger farmers is a permanent change. We have chosen to present model projections based upon each of these two assumptions.

The other major parameter for the model is the ratio of farm entries to farm exits. Historic values for this parameter are portrayed in Figure 28. Once again, the intercensal period of 1986-91 is associated with an outlying value. Again, the choice is to assume this is an aberrant value, or is part of cyclical phenomena. We have again chosen to use both the parameter values for both the most recent intercensal period and the average parameters for the past three inter-censal periods. Use of both entry to exit ratios assumes that the decline in entry of teenage male farmers and both men and women aged 20-29 is a permanent feature of modern adjustment behaviour.



Figure 28 Entries to farming as a per cent of exits from the farming in the same inter-censal period

The final choices are the level of geographic aggregation at which to apply the model and whether to segregate into separate industry models. There is markedly different entry and exit behaviour of farmers in different agricultural industries (Barr, Wilkinson, & Karunaratne 2003). However, the ABS has made significant changes in the method of coding agricultural industries in the 2001 census. These changes have greatly reduced the number of farmers allocated to the 'agriculture unstated' code. This will greatly enhance the utility of Population Census data for researching structural change in agriculture. However, these changes make it difficult to calculate accurate exit rates for individual industries between 1996 and 2001. Modelling demographic change in specific agricultural industries will be easier when we have data from the 2006 census. Until that time, we have chosen to ignore industry in our modelling.

Geographic segmentation is far more tractable challenge. It is possible to estimate reliable values of entry and exit for many SLAs, the lowest level of 'place of enumeration' data aggregation available from the Population census. These estimates will be unreliable for those SLAs with low farmer populations, requiring the substitution of appropriate values. In this study we have avoided this problem by choosing to model population change in these SLAs by applying the entry and exit parameters of larger agricultural regions with similar industry characteristics. These regions are described in an appendix. These agro-structural regions are each characterised by a unique and relatively homogenous agricultural structure.

### Projected future demographic structures: Australia

The outputs of the two model runs are summarised in Figure 29 and Figure 30. Scenario one is based upon the use of entry and exit ratios derived from the most recent intercensal period 1996 to 2001. Scenario two used parameters that are an average of exit and entry ratios observed in the past three intercensal periods (1986-2001). The two choices of parameters give markedly differing outcomes in projections of total farmer numbers to 2031. Scenario one parameters produce a relatively stable farmer population, declining to 170,000 by 2031. The use of scenario two parameters results in much more marked decline, to less than 120,000 farmers in 2031.

The two scenarios produce quite similar impacts on the age distribution of the farmer population. Since 1981 farmer age has been rising steadily. Our projections suggest this rise will continue for at most another decade before a gentle decline commences. The choice of model parameters makes only a small difference in the maximum median age. Scenario two in which the farmer population declines more sharply is associated with a lower peak in the median age.

This peaking in the median age of farmers around 2011 is an outcome of the changes in farmer entry and exit amongst younger persons in the 1980s. Since that decade the pattern of entry has stabilised. The last cohort of twenty year old farmers who entered farming in large numbers were those aged in their twenties in the 1970s. By 2011 most of these farmers will be in their 60s. By then the demographic transformation of the Australian farmer population that began in the 1980s will have reached its conclusion. By the 2021 census, most Australian farmers will be those who have entered farming in their mid career.

A secondary impact is the progression of the baby-boomer cohorts of farmers through their farming career. This influence has been made clearer in a separate study of the Victorian sheep industry (Barr, Wilkinson, & Karunaratne 2003). The sheep industry has seen two great inward migrations. Many members of the generation born in the late 1920s entered the wool industry in their early 20s immediately after the Second World War. This generation was the most populated age cohort in the sheep industry in the 1976 and 1981 censuses. From age 60 onwards these farmers appear to have embarked upon strategies to retire from farming as part of an inter-generational transfer strategy. In the 1986 census their children, the early baby-boomers, replaced them as the most populous age cohort. These baby-boomer farmers born, during the period 1946–1951, have been the dominant cohort of sheep farmers for the period 1986 through to 2001 as their age cohort has shifted through the 35-39, 40-44, 45-49 and now 50-55 age groups. After 2011 we can expect many of these farmers to have retired or be close to retirement. Their exit will contribute to a gradual decline in the median age of sheep farmers.

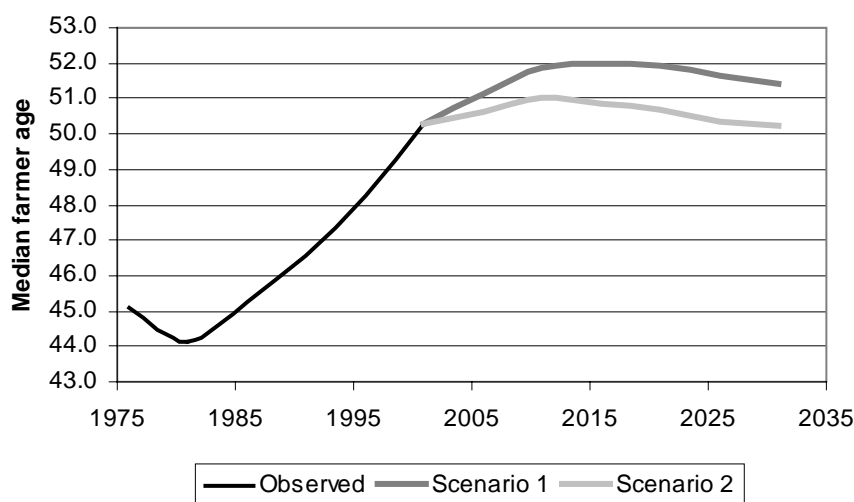


Figure 29 Historic and modelled future farmer median age using parameters derived from the 1996-2001 period and the 1986-2001 period

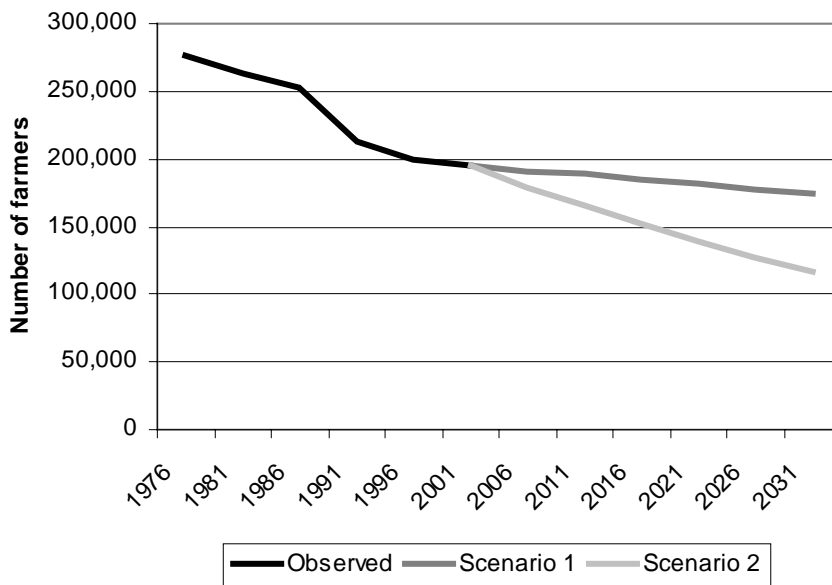


Figure 30 Historic and modelled future farmer population using parameters derived from the 1996-2001 period and the 1986-2001 period

### Projected future demographic structures: the regions

Figure 32 to Figure 33 portray the outcome of modelling for agricultural regions of Australia using scenario one and scenario two. The most striking feature is the increasing median age predicted for all regions. However, there are large differences in the predicted maximum median age. The oldest median age is projected in the Southern Hill country and Northern Beef and, in the slower adjustment scenario, Coastal Queensland. In each of these regions, landscape amenity and lifestyle farming are considerable influences upon the structure of agricultural communities. In contrast, Irrigated Horticulture Settlements and West Australian Cropping regions maintain significantly lower median ages in at least one of the scenarios. These areas where landscape amenity and lifestyle choices by the non-farming community are less likely to influence the structure of the farm sector.

The choice of model parameters has a large effect on the pattern of adjustment in some regions and little impact in others. The effect is least with the West Australian Cropping and the Closer Settled Grazing zones. In each of these regions there are many financially large agricultural businesses with the capacity to fund farm aggregation. The pattern of declining farmer numbers appears to be stable over time, justifying some confidence in the projections. Patterns of adjustment are similarly stable in the peri-urban area. In contrast, patterns are far less stable over time in most other regions. We suspect that farming in these regions is undergoing a form of state transition, with adjustment being in response to multiple forces of influence.

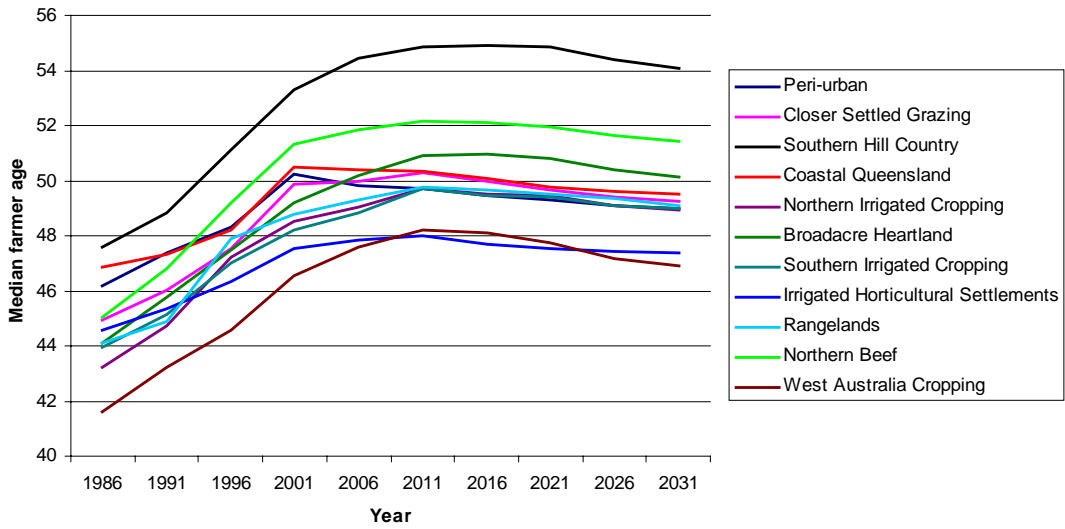


Figure 31 Projected median farmer age for selected agricultural regions using parameters based upon 1986-2001 intercensal periods (scenario 1)

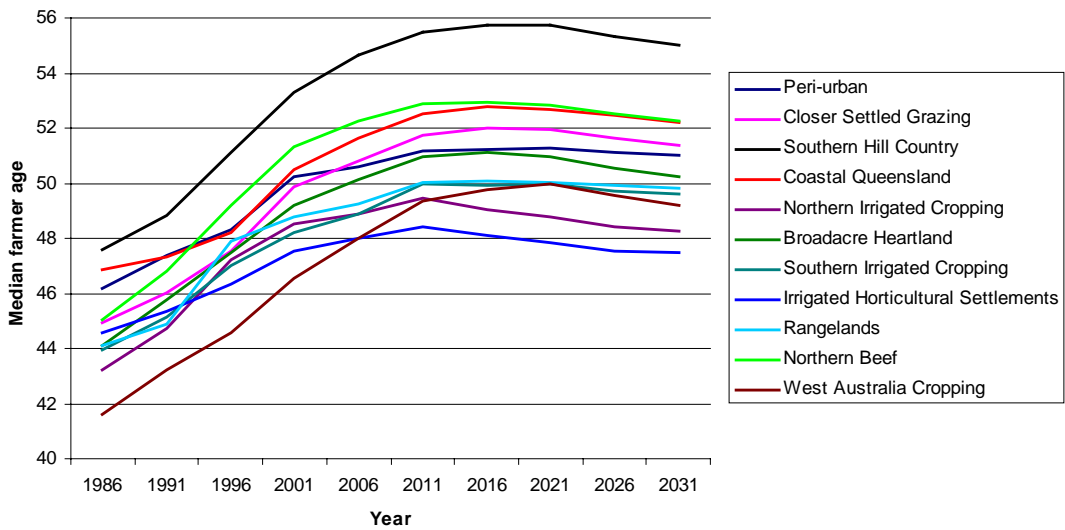


Figure 32 Historic and projected median farmer age for selected agricultural regions using parameters based upon 1996-2001 intercensal period (scenario2)

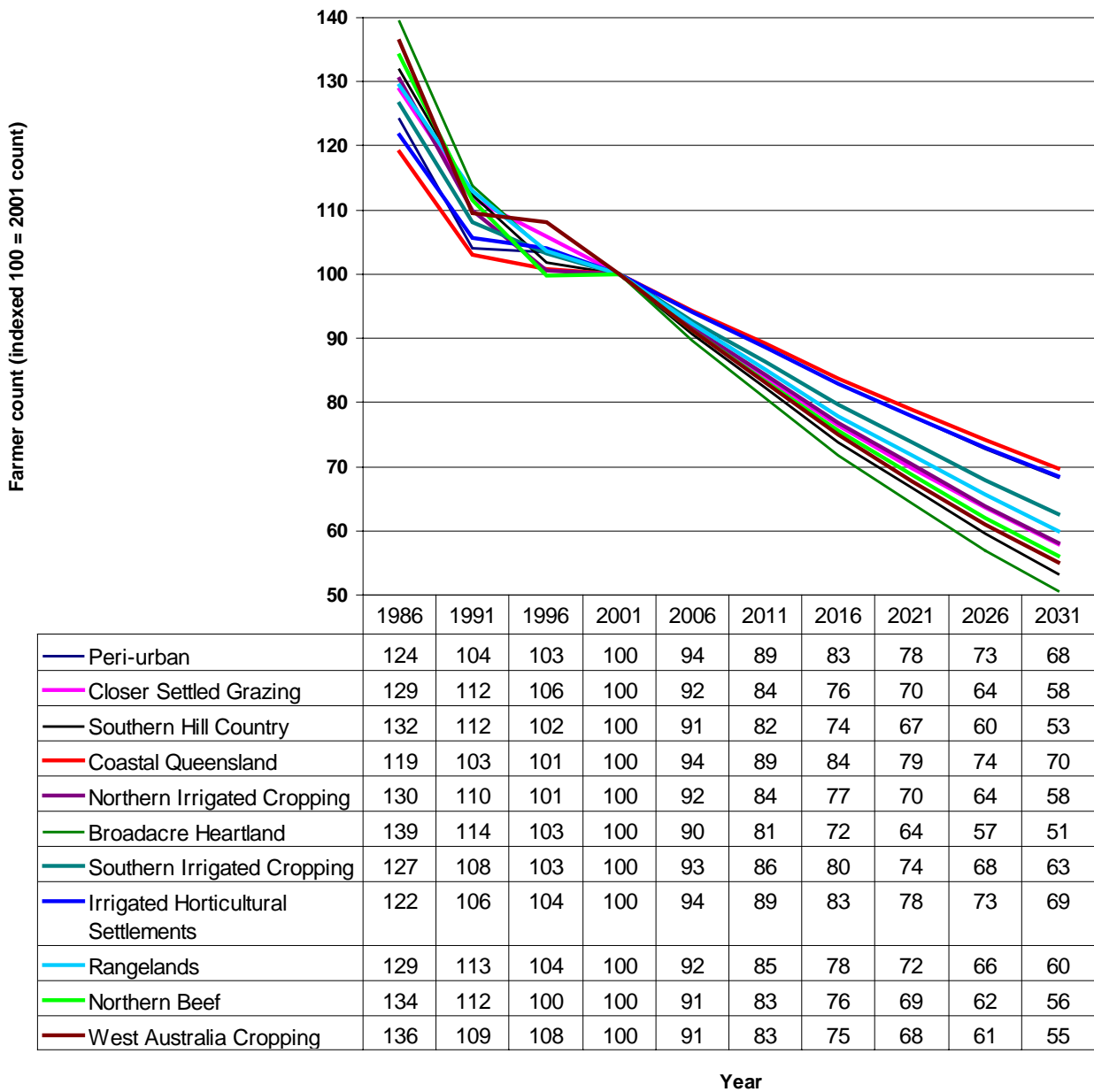


Figure 33 Historic and modelled farmer population for selected agricultural regions using parameters based on 1986–2001 intercensal periods (scenario 1)

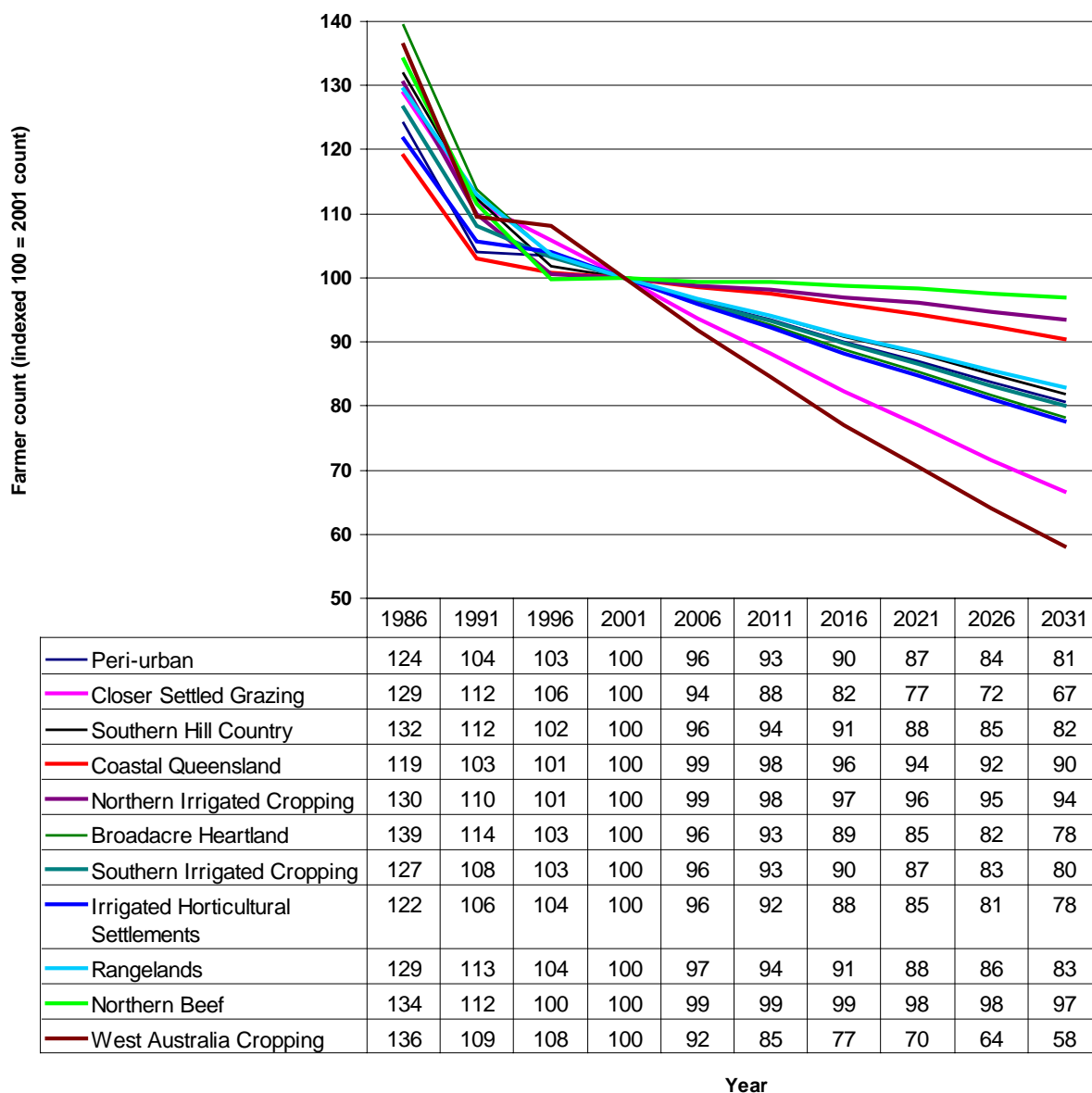


Figure 34 Historic and modelled farmer population for selected agricultural regions using parameters based on 1996–2001 intercensal period (scenario 2)

### Scenarios and modelling uncertainty

In scenario two there is a clear relationship between the extent of increasing median age and the rate of farmer population decline (Figure 35). Regions with a projected greater decrease in farmer population are also projected to have a higher increase in median farmer age. The linear relationship is extremely strong ( $R^2 = .89$ ).

There are three clear groupings of regions.

- Regions projected to have a high population loss and a high increase in median age. These are the regions that could be best described as traditional broadacre farming. It includes both dryland-cropping regions, the northern irrigated cropping region and the northern beef and southern hill country grazing regions.
- Regions projected to have a low population loss and small increase in median age. This included three regions, each of which could be characterised as agriculture within a relatively densely populated landscape... irrigation horticulture, coastal Queensland and peri-urban agriculture.
- Regions projected to have moderate population growth and a moderate increase in age. This includes three regions of divergent natures— closer settled grazing, rangelands and southern irrigated cropping.

The reason for this strong relationship between increasing age and population decline within this scenario is simple. Farmer population decrease in Australia is clearly caused by decreased recruitment of the young to farming.

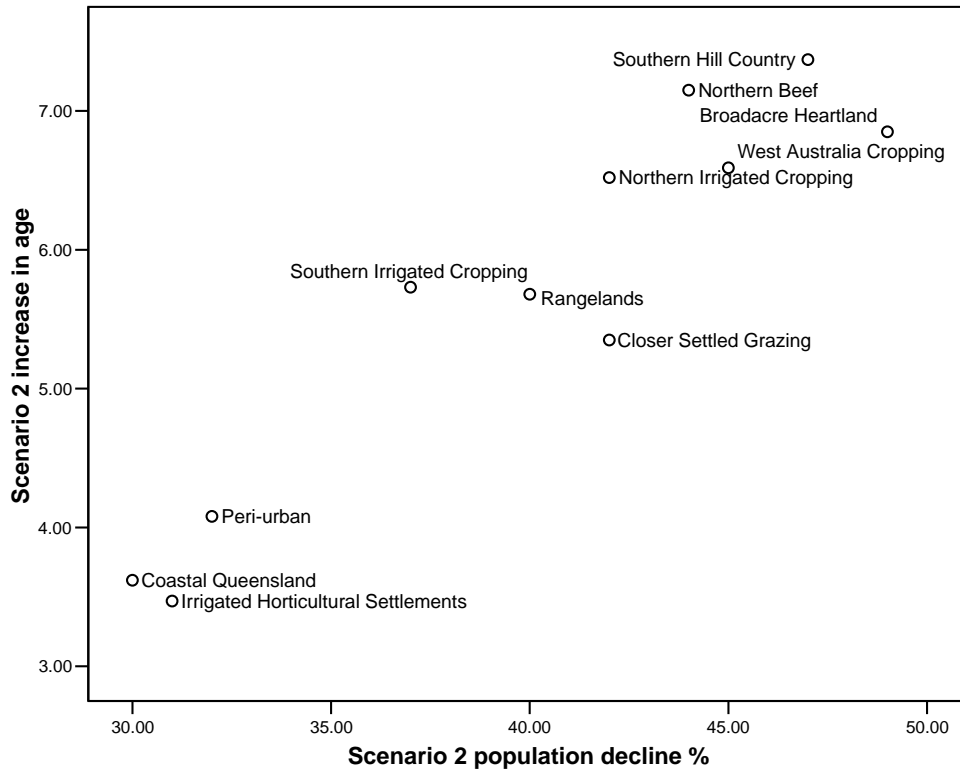


Figure 35 Relationship between farmer population decline and increasing median age for custom regions using scenario 1

In scenario one there is a breakdown in the relationship between decreasing farmer population and increasing median farmer age (Figure 36). Not all regions are impacted to the same extent. If we take first the high population loss regions from scenario two:

- The Western Australian cropping region is little impacted by the change in scenario parameters. In both scenarios it displays high population decline and a high increase in median farmer age. We conclude there is a high degree of confidence in the scenario outcomes.
- The other four regions with high population decline and ageing in scenario two all show markedly lower population decline in scenario one. Northern beef shows an almost stable farmer population. Ageing is little impacted in each of these regions. We conclude that the scenario projections for increasing median age are reliable, but there remains a high degree of uncertainty about future farmer population.

The second group of regions to consider are those with low rates of farmer population decline and small increases in median farmer age under scenario two. These are the regions where farming takes place within a highly populated landscape. Each of these regions shows decreased rates of population decline and increased rates of ageing under scenario one. Again, the impacts of parameter change vary significantly between regions.

- For irrigated horticultural settlements, the change of scenarios has only a muted impact. The scenario predictions are probably reliable.
- For the coastal Queensland region the change of scenario has a major impact on projected population and age. Under scenario one farmer population decline is much lower and the increase in median farmer age is much greater. The degree of certainty in our projections is therefore low. This should be no surprise given the current impacts of coastal development, migration and government intervention in the restructuring of the sugar industry.
- The impact of scenario change on the peri-urban region is moderate for both age and population.

The final group of regions are those experiencing moderate age and population impacts under scenario two. Two of these (rangelands and southern irrigated cropping) show significantly reduced population decline under scenario one, but little impact upon age. The other, closer settled grazing, shows both significantly reduced population decline and a higher increase in median age.

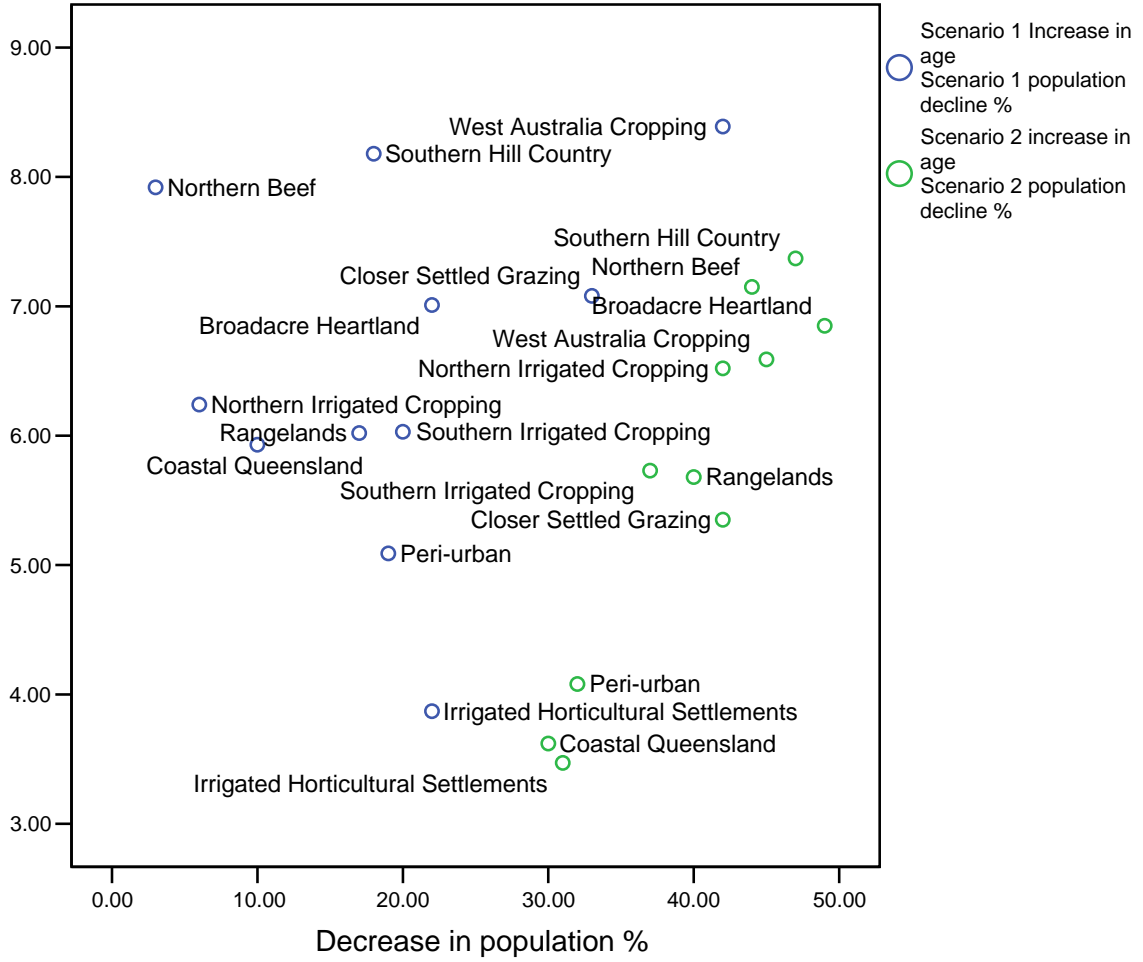


Figure 36 Relationship between increased median age and population decline under scenarios 1 and 2 for agrostructural regions

## Social change and what can't be modelled

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Our longitudinal analysis of farmer entry and exit behaviour has revealed a number of state shifts in the adjustment of Australian agriculture, driven by major social change within the wider Australian community. The changing social role of women and increased expectations of education participation have permanently shifted patterns of entry to farming and retirement from farming. Having explored these changes, we have then displayed some temerity in attempting to model future farming populations over the next 30 years. Modelling demographic change over a 30-year period using only past behaviour patterns risks ignoring potential future social, economic and environmental changes that may similarly reshape agricultural communities over the next 20 years. In this next section we review some of the forces that are reshaping the demography of farming. Some of these forces can be assumed to be accounted for within the existing demographic model. Others may well catalyse quantum shifts in the social structure of rural communities that we cannot anticipate or model. The sudden and unexpected nature of such social shifts can be demonstrated in the apparent population turnaround in many small regional towns that have experienced a sudden influx of city migrants. This has been driven by decreasing home affordability in major cities, itself an outcome of a prolonged period of economic prosperity and the deregulation of the financial system in the 1980s.

### Economic forces

**The declining terms of trade for farm products:** Declining terms of trade have been a long-standing feature of Australian agriculture. The rate of terms of trade decline appears to have slowed in the past decade, leading to some debate as to a fundamental shift in the nature of agricultural markets. Such optimism needs to be tempered by an understanding that declining terms of trade are driven by technological innovation. In agriculture, technology often improves productivity by allowing increases in farming scale and improvements in labour efficiency. New technology will always be adopted by segments of the agricultural and food industries if it offers economic advantage. Minor advances in the technology of managing existing farming systems bring gradual cost pressures upon those least able or willing to adopt these innovations. The result is a gradual change in the structure of agriculture as farm numbers decline. In recent years there has been an average annual 1.5 per cent decline in the number of farm establishments in Australia. This decline is the price of maintaining competitiveness (Lindsay & Gleeson 1997). Of course, the impact of declining terms of trade is not always experienced as a gradual pressure. Current forecasts are for oversupply in the wine grape market and potential under supply in the wool market. If these predictions are correct, price trends in these industries will deviate significantly from the long-term trend.

Overall, the terms of trade pressures will ensure the number of farms will continue to decline, and fewer farms will produce more and more of the agricultural production of the country. These trends are obvious not only in Australia, but in other developed nations (Anon 2000; Economic Research Service 1997; Freshwater 2000).

**Consequences of technological innovation:** Major technological shifts often bring major changes in the structure of agricultural communities. A review of the major technological shifts in western agriculture by the Western Agri-Food Institute (Anon 2000) concluded that major technological shifts in agriculture always create winners and losers, and that the new technology often shifts the frontier of agriculture. The most significant major innovation cited in the Western Agri-Food Institute review is the introduction of the internal combustion engine to agriculture. This assisted in doubling the volume of wheat production in Australia and opening a new frontier in the West Australian wheat belt. The long-term concentration of most of the Australian dairy cattle within Victoria is another example of the redistributive impact of new technologies and management practices.

The question we must consider is whether there are new technologies that promise or threaten a similar shift in the structure of Australian agriculture. Two technological innovations are regularly discussed in contemporary debate: genomics and information technology. The former may create new crops or niches, or change the relativities of advantage between different regions. Unlike the majority of earlier major technological innovations in agriculture, genomic knowledge is strongly protected by intellectual property law. The technology may favour certain types of farms... those who are more closely integrated into the marketing chains of agri-food conglomerates which own the technology. This may facilitate much more tightly integrated production and marketing chains. These potential impacts of genomics are unclear in the current debate over the ethics of genetic manipulation of food.

The impacts of information technology are generally expected to be the removal of many intermediaries from marketing chains (disintermediation). The most obvious example in Australian agriculture is the gradual demise

and sometimes re-invention of the wholesale fruit and vegetable markets under the influence of growing contract and direct supply relationships between major supermarket chains and producers. Changes in intermediary relationships are occurring in other industries as internet-based marketing tools are adopted by both producers and suppliers.

**Policy innovation:** Major policy and administrative structure changes will have impacts upon the patterns of structural adjustment that will not be indicated by the demographic modelling used in this project. De-regulation can be expected to accelerate the historic trend of consolidation of the Australian dairy industry to Victoria and Tasmania (Bureau of Rural Sciences et al. 2001). Likewise, changes in water policy may catalyse new patterns of adjustment within the irrigation regions. There is already emerging evidence of a new pattern of farm exit within the dairy industry catalysed by recent water sector reform and changing patterns of rainfall (Barr, Wilkinson, & Karunaratne 2004). Finally, direct government intervention within structural adjustment, such as recently proposed for the sugar industry, may have a limited impact upon adjustment within coastal Queensland.

### Changing social values and structures

**The continuing urbanisation of Australia:** Urbanisation is an outcome of the impact of technological innovation upon agriculture. Australia is urbanising rapidly and at an accelerating rate. The State of Victoria provides a clear example. In 1920 there were 20 Victorians for every farm in the state. By 1970 the ratio had risen to over 50. Today the ratio is 175 Victorians for every farm in the state. Modelling of the potential future adjustment of agriculture suggests that this ratio may approach 400 by 2021. The contribution of agriculture to the national economy can be expected to reflect a similar decline. There are some obvious consequences that flow from this.

The culture of farming will have less and less influence upon the creation of Australian social values. The political influence of the farming lobby will decline. This is but a continuation of a well-established trend. More importantly, there will probably be increased demand for non-productivity values from agricultural resources. We can see the greatest example of this in the use of the concept of *multi-functionality of agriculture* in the European position on agricultural trade reform. In the Australian context, multiple functions will include improved quality and quantity of water supply, improved health of riverine habitats, 'clean' food and landscape amenity (Cocks 1999a; Ellyard 1998b). It is possible these demands will appear more and more onerous when viewed from a traditional farming perspective.

Currently, demand for landscape amenity is a major influence upon the pattern of structural change in Australian agriculture. The influence is manifest in the high price of land in the more amenable and accessible parts of the rural landscape. These higher land prices restrict the capacity of agriculture to adjust to maintain competitiveness and inexorably drive the path of adjustment to a non-commercial agricultural future. The potential for these amenity pressures to increase over the next 20 years is strongly linked to the demographic structure of the nation. Research in the United States has shown the close relationship between rural area development and natural amenity. Over a thirty year period, regions with the lowest landscape amenity, and often the most competitive agricultural businesses, experienced the greatest population losses (McGranahan 1999a).

**The decline of farming as a lifestyle identity and the growth of market based identities:** Increasing demand for multi-functional agricultural services is only one of the changes that will be brought about by changing social attitudes. Over the past thirty years there have been major shifts in social values within agricultural communities in Australia. These changes have been documented by Bryant (1999). Bryant described three shifts in social belief structures that lead to land managers shaping new understandings of their roles as a farmer. These changes will have a significant influence upon the future patterns of structural adjustment in Australian agriculture.

The first major shift has been from a view of oneself as a farmer towards a more urban occupational identity. Farm managers increasingly are likely to see themselves less as a farmer than as a manager with skills that have much in common with other business managers outside agriculture. This is in part an outcome of the shift towards off-farm work and in part a response to the promotion of a more managerial view of farming through industry, education and government organisations. It is not unreasonable to speculate that we may see a decline in the traditional perspective that 'farming isn't a job, but a way of life', and that this may change the pattern of farm exit decisions made by Australian farmers as well as the way farm businesses are managed. Current evidence is that younger farmers are more likely to conduct sophisticated business planning (Tanewski, Romano, & Smyrniotis 2000). The increasing capacity of the agricultural sector to interact with the urban world,

the greater demands for sophisticated business management and production skills will further change the traditional agrarian values of the Australian farm community. The second social change identified by Bryant is what she has called 'the centrality of the market in constructing the self'. This shift is seen in the trend for increasing numbers of farmers to consider their value in terms of strategic decision making on the farm, rather than their ability to undertake physical labour in an outdoor setting. This reflects trends towards the use of the language of managerialism and entrepreneurship within the wider community. As this trend continues, farm managers will less and less see themselves as farming for the way of life, and more and more construe their farming activity as a search for business profit and market opportunity, or construe their farm as a residence.

**Rural youth and the march of modernity:** A related social values shift is the lessening attractiveness of agriculture as a career destination for younger rural Australians. This can be seen both in the decreasing entry of younger persons to agriculture and in the continuing lowering of entry scores for tertiary agricultural courses. This loss of interest is not strongly related to the fluctuations in commodity prices, but reflects the impact of modernity upon the rural youth population (Gabriel 2000). Analysis in this report shows this is the major factor contributing to the increasing average age of Australian farmers and is leading to new forms of later age agricultural entry and inter-generational transfer. These changes have the potential to create patterns of farm gentrification in some closer settled agricultural regions. These changes also have the potential to accelerate the shift towards less traditional farming identities. There is a strong likelihood of this phenomenon being accelerated by changes in the age structure of the non-farming community.

**Changing gender relationships:** The final social change identified by Bryant is a shift in gender relationships on the farm. Fewer and fewer farm women identify with the traditional role of "farmer's wife" and increasingly are likely to identify as a joint farm manager or as having an occupational life separate from the farm business. Women's participation in the farmer workforce has remained constant at 60 per cent of the level of male participation since 1976. In the same time, women's participation in the Australian workforce has been steadily rising. Many women living on farms today work off the farm to support farm family living standards based upon the social norm of the two-income family. This trend is a reflection of social trends beyond agriculture and has been well documented by a number of Australian researchers. (Alston 1995; Argent 1999; Gournaut, Rasheed, & Rodriguez 1999; Nelson 1999; Oldrup 1999).

The change in women's roles in wider society over the past 30 years has had some profound impacts upon the process of structural change in agriculture. One of the most obvious implications has arisen from the entry of women into the workforce outside farming. This has greatly increased farm family dependence on off-farm income earned by women. It could be argued that this has in some areas reduced the pressure for structural change in agriculture by removing the imperative to increase income through farm business expansion.

The change in women's roles extends beyond the workplace into family and relationship expectations. De-traditionalisation of marriage relationships is a feature of the modern Australian farm family. Just as in urban Australia, women's expectations of marriage relationships are greater than they were a generation ago. The alternatives to continuing in an unsatisfactory marriage are more socially acceptable than a generation ago (Wolcott 1999). Marriage as an economic contract has been replaced by marriage as an emotional relationship, recognition of the crucial role healthy relationships play in personal wellbeing (Weston 1999). Fewer women on farms are today willing to endure what they consider to be an unsatisfactory relationship or family lifestyle (Dempsey 2001). In a study of farm families in the early 90's, farm women's lack of satisfaction with the marriage and family relationships was the greatest predictor of farm business failure. This was more important than farm size or profitability (Barr 1999). Thus farm adjustment patterns were, in part, being driven by pressures for relationship adjustment within families. The result in the locality under study was a shift in the pattern of adjustment from consolidation towards churning and fragmentation. The implication of this is that the successful farm business management team today has a greater need to develop the skills of communication and teamwork within the household than may have been the case a generation ago.

The development of the careers for women over the past generation has increased the difficulty of the modern young farmer in finding a partner. The need to consider dual careers in relationship establishment may lead to new patterns of migration as aspiring farmers seek to accommodate the needs of potential partners who do not wish to adopt the traditional role of farm wife. There is anecdotal evidence of decisions to exit farming or move farm location to improve the chances of finding a partner. The premium that must be paid to purchase a farm within commuting distance of major centres in part reflects the proximity to employment for members of the farm household.

**The demographic progression of the baby boomer generation:** The first of the 'baby boomer' generation reached the early retirement age of 55 in 2001. The retirement of this generation will peak between 2010 to 2015. This progression will have a significant impact on the structure of the Australian labour market

(Access Economics 2001). Demand for labour will remain relatively constant, while labour supply will slow and eventually decrease as a result of declining fertility driven by changing social values (Weston & Qu 2001). The resulting shortage of labour will mean agriculture will need to compete against improving employment prospects for younger members of farm families. It is also possible that the increase in the number of retired superannuants will boost the current trends towards the development of amenity farm landscapes.

### **Broader environmental factors**

**Fossil fuel dependency and biomass production:** Some Australian futures researchers believe fossil fuel dependency will be one of the greatest pressures for change in Australian agriculture in twenty years time (Foran 2000). Modelling of Australian energy demand and supply over the next fifty years suggests there may be a rapid turnaround in the balance between supply and demand some time after 2025 (Foran 1998). This would impose major costs upon the current agricultural production and food distribution systems. One outcome may be the growth of a bio-fuel industry to supply feedstocks for ethanol or methanol production (Foran & Mardon 1999). Such a change would radically alter some landscapes and social structures.

**Climate change:** Increases in the concentrations of carbon dioxide and methane in the atmosphere are well documented. It is considered likely that this will change climate, particularly rainfall and temperature. Whilst the nature of these changes at a regional level is still the focus of much research, there has been some analysis of the potential impacts of these changes on both agricultural systems and the natural resources which support these systems. There might be significant shifts in frost-free areas, high chill zones, pest infestation zones and areas of adequate rainfall for cropping (Howden, Reyenga, & Meinke 1999).

**Catchment plan implementation:** Increasingly, catchment communities are working with governments to develop catchment plans. A major focus of catchment plans is changed land use, with an emphasis in many areas upon increasing both tree cover and the area of perennial pastures. Increasing tree cover, if achieved through industrial plantation development, will have major impacts upon the social and economic structure of some rural communities. Evaluation of the social impact of plantation development in south-western Victoria has shown that there will be significant reduction in the demand for labour over the next 20 years (Petheram et al. 2000). Although the sowing of perennial pastures is an innovation more compatible with existing farming systems, it is not clear that success in this venture will not be without the potential for generating its own social impacts upon the structure of farming.

## Answers to some common questions

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A number of the trends described in this report may be construed by rural Australians as a reason for alarm. The most notable of these trends are:

- the projected decline in farmer population over the next 20 years;
- the 60 per cent decline in the number of younger farmers since 1976;
- the increasing average age of Australian farmers;
- the large number of small farms in Australia; and
- the migration of urban Australians to some rural environments.

These trends inevitably raise a number of questions about the future of rural Australia:

- Will there be enough farmers to produce Australia's food?
- Are there too few young farmers?
- Are farmers getting too old?
- Will newcomers limit our right to farm?
- What does this mean for our capacity to protect the rural environment?

This final section attempts to provide some answers to these questions. These answers do not masquerade as the final word on these questions. This research project did not explore these issues in any detail. While there are clear answers to some of these questions, there is insufficient research evidence to allow us to draw any firm conclusions for the other questions. Finally, the answer to some questions will depend upon personal values, and the personal values of these authors may not sit comfortably with those of some readers.

### **Will there be enough farmers to produce Australia's food?**

When viewed in isolation, the large decline in the number of farmers that occurs over several decades can appear quite alarming. In presentations of these results to rural communities, we are regularly asked 'who will produce the food that Australians will eat in years to come?'

The decline of farming area populations is an outcome of the continued increases in productivity achieved by many agricultural producers. If these increases are not matched by increased demand for products by consumers within the available market, then price declines are inevitable. Over time the farm sector experiences this pressure as a long-term decline in its terms of trade. This pressure on the terms of trade is now interacting with the process of globalisation. Globalisation is driven by improvements in transport technology, sometimes augmented by the dismantling of trade barriers. Improved transport enlarges the market sector available to the farmer, but it also increases the pool of competitors, most of whom are also chasing improvements in productivity. The compression of the terms of trade continues in the wider market, driven by the same processes.

Farm businesses cannot ignore the compression in their terms of trade. The farmer is surfing on a wave of technology to keep ahead, and yet his or her own actions are fuelling the wave. The traditional response of successful farmers has been to make sure they capture their share of the possible gains in business efficiency. Often these efficiencies can only be achieved by increasing the size of the business, farming more land. A larger header can be used to make a cropping farm more efficient if the same number of workers can use the header to harvest a larger area of grain crop. Those who choose not to, or who are unable to pursue increased productivity, will find that their farm becomes increasingly smaller in financial terms as the years progress. These smaller businesses will eventually be absorbed by larger businesses or if there are no larger farms seeking to expand, they will become one of the large number of small semi-commercial farms the more attractive parts of the rural landscape. In the long run this process will catalyse a continuing decrease in farm numbers. Fewer farms will produce more and more of the agricultural production of the country. The pressures for change are more intense in industries with a history of innovation. In the past 25 years the volume of milk produced by Australian dairy farms has increased by 50 per cent.

To return to the question of who will produce our food in the future... it will be Australian farmers, but far fewer of them than today. Declining numbers of farmers does not lead to a reduction in the amount of food produced. Rather farmers, each producing more than last year, help bring about the decline in the number of farmers.

### **Are there too few young farmers?**

Perhaps no other finding in this report will raise more discussion than the sharp decline in the number of young farmers. But is this really a cause for concern? Australia has a large number of small farms. The financially smallest 50 per cent produce only 10 per cent of value of production. The financially largest 10 per cent produce 50 per cent of the value of production. More than one laconic humourist in the Australian farm sector has described traditional inter-generational transfer of the farm as a form of child abuse. Perhaps there is more than an element of truth in this quip if the farm passed on is one of the numerous small farms in Australia, and is accompanied by an unrealistic expectation that it will be possible to build a future career based upon that farm.

Declining populations in Australian farm communities are generally not a result of persons abandoning failed farm businesses. Farm family businesses are remarkable resilient in the face of variable market and climatic conditions. There are often good reasons for this commitment to continued farming in the face of setbacks. Many farmers in their mid-career group will have significant in farm equity, in farming skills, and few years in which to capture the benefits of a change of career. The decision to leave is likely to be taken by the new generation that decide not to commence farming, often with the encouragement of their parents. When many farming families in a landscape are taking these decisions, the result is a social landscape in which the generation in their 20s and 30s is 'missing'. This has been the pattern of agricultural adjustment for many generations. The following quote concerns the United States in 1914.

*"One of the problems that is all the time tugging at the heart of farmer of this country is the absence from the farm of the young man. There are many neighbourhoods in which not one in ten of the male members of the community can be truthfully called a young man... The farmers are deprived of the earnest, intelligent help which naturally belongs to them, rural society loses one of its best elements, the cities are overcrowded and all parties at interest are losers... The shops, the factories, the stores and the offices are swallowing up sturdy young men every where"*  
(Bowsfield 1914)

The same processes of differential exit by the young and the associated increasing farmer age were described in a special 1963 issue of the US Journal of Farm Economics (Clawson 1963; Kanel 1963; Tolley & Hjort 1963). This issue focussed on the rapidly ageing farm population of the eastern United States. By the 1990s, the US research focus had shifted to similar processes occurring in the central west of the US (Rathge & Highman 1998). By then agricultural decline in the east of the United States was less of a social concern as it was no longer associated with overall population decline. The focus of farm concern in the east was on the conflict between amenity, environmental protection and the right to farm.

Rather than lament the declining number of young farmers, we should first ask whether the number of young persons entering the occupation of farming is sufficient to maintain our farming industries. Maybe there are too many entering to allow young farmers a reasonable chance of a satisfying and reasonably remunerated career? How many young farmers is enough?

To attempt to answer this question we need to start by estimating how many young families entered agriculture between the last two censuses? As indicated earlier in this report, counting the number of new young entrants to agriculture is complicated by the mix of dual and single farmer households and the common practice of staging entry with a transition period within the parents' household. For the purposes of this exercise, we will assume that all new farmers will at some stage be counted in the census as changing their address when they establish an independent household. In the five years between the last two censuses, approximately 8,000 persons aged less than 35 years of age, and who described farming as their major occupation, established new households. This estimate is necessarily imprecise as our identification of new households is based upon households' reports of address changes. We can make an approximate adjustment to account for the existence of dual farmer households and reduce this to a count of approximately 6,000 new households including at least one young farmer.

How many farms were available for these new households? In 2001 the Agricultural Census counted 98,500 farm establishments on which the operator described farming as their main occupation. The annual rate of exit from farming over the past inter-censal period was close to 4.5 per cent. The long-term rate of decline in the count of Australian farm establishments is 1.3 per cent per annum. We can make some rough simplifying assumptions about the relationship between career exit and farm ownership transfer to estimate that annually approximately 3.2 per cent of farm establishments become available for new operators to take over. Over the last inter-censal period this is 16 per cent of all farms supporting someone who described farming as their main occupation, or 15,766 farm establishments. Many of these farms will have been quite small.

How many moderate to large-scale farms were available for young farmers to begin their career? There is strong evidence that the rate of ownership turnover is higher on small farms than large farms (Jackson-Smith 1999). Even if we ignore this evidence and assume a uniform rate of farmer exit across all farm sizes, only 5,500 farms with a gross income greater than \$200,000 would have become available for younger farmers in the last inter-censal period. Many of these larger farms would have been inherited or purchased by older entrants. It is quite possible that if we were to adjust for the lower rate of turnover on larger farms and the entry of older persons, fewer than 3,000 of these larger farms would have been transferred to a younger farmer.

This very approximate analysis leads one to the conclusion that, even the current low rate of entry of younger persons to agriculture may still be greater than desirable if one hoped that young new entrants had a reasonable chance of a stable career in farming. Is it possible to increase the opportunities available for younger persons to enter agriculture?

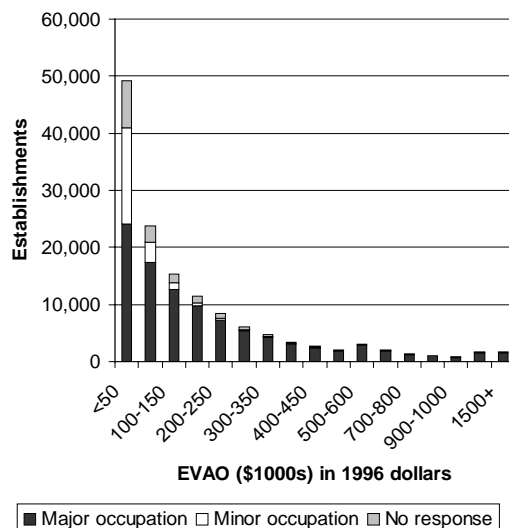


Figure 37 Number of agricultural establishments by EVAO and occupational status (2001)

### Are farmers getting too old?

Is the increasing average age of the farm community a cause for concern? Commonly there is an unstated fear behind this concern: will an increasing number of older farmers mean there will be a loss of innovation and creativity within the industry? Will older farmers be less likely to invest in farm development? One would expect that decisions to seek farm productivity would be driven by need and desire. The need is the need for present and future income. The desire is that passion for success in farming.

Prima facie there seems to be logic in the expectation that younger farmers are more likely to invest in business development. The need for income in the years of family establishment and support is a factor that could be expected to drive the need for increasing income-earning potential. However, this simple relationship is complicated by a similar need for income when an older farmer is expecting a twenty or thirty-year old child to join the family business. Expectations of inter-generational transfer are generally strongly related to farm size. Hence we can expect that the relationship between age and farm development will be strongly mediated by farm size and family succession expectations. More recent trends in farm family behaviour further complicate this picture. Younger farm families are now increasingly likely to seek off-farm work rather than farm build-up as a solution to family income needs. And further, as traditional early career intergenerational farming is gradually supplanted by mid career entry, we can expect that these older new entrants are more

likely to be making a choice for farming as a career driven more by passion than a lack of other options. Later entry may be bringing greater passion into the business of farming. The example of Bert Farquhar shows age is no barrier to farm development. In 1986, at the age of 68, Bert Farquhar paid over ten million dollars for the Rushy Lagoon property in north western Tasmania (Grant 2004). He then embarked upon a major farm development program that at one stage he calculated would be complete by his ninety-third birthday! Just how exceptional was Bert?

There is very little research in Australia that can shed light on these speculations. That research that has been done is mostly at least 20 years old, suggesting it may be of limited relevance in today's agriculture (Barr, Ronan, & Volum 1979; Salamon & O'Reilly 1979; Yates 1972). There is some evidence of a relationship between education and the adoption of new practices on farms (Bamberry, Dunn, & Lamont 1997). Given there is a strong relationship between age and education, this hints at a positive relationship between age and adoption. However, we can expect that the future older entrants to farming will be far better educated than the older farmers of today.

In the past two decades there has been more Australian research into the adoption of conservation practices rather than productivity innovations. Within this still small body of research the relationship between adoption and age is not strong. Alan Curtis and his colleagues considered the relationship between age and the adoption of conservation farming practices in a number of Victorian catchments. His general conclusion was that there was little relationship between age and the adoption of most conservation practices (Curtis & Byron 2002). (Curtis et al. 2000a).

With a lack of clear evidence of an age productivity relationship in studies of individual farmer behaviour, can we detect such a relationship in area-based data? Again, there are limited possibilities because of the lack of relationship between data in the Agricultural and Population censuses. We do not know whether the older farmers are predominantly on smaller farms or less productive farms. The best we can do is observe that productivity is higher in agricultural industries with a younger median age (dairy industry) than it is in industries with an older median age (beef, wool). But here it is difficult to unravel causality. Those industries that have a history of low productivity gains are more likely to develop an older age profile as younger people respond to the lessening opportunities within that industry. A long history of low increases in productivity leaves a farming region with fewer prospects for its younger members to take on farming as a career. The young move elsewhere and the median farming age increases.

In conclusion, there is no conclusion. We do not know what impact the increasing median age of farmers will have upon industry performance. Agriculture is not alone in this experiencing trend. Similar increases in average age are occurring in other occupations, partly as a result of the structure of the Australian population. Perhaps there is no need to be concerned, as increasing age is a symptom of other processes within rural Australia, processes over which we have little policy influence (Barr 2003).

### **Are there too many small farms?**

In the 1960s, 70s and 80s agricultural economists and others involved in agricultural policy debate were much concerned with the 'small farm problem' (Johnson & White 1977; Mauldon 1968; McKay 1967). A large number of small farms was seen as a problem for two reasons: economic efficiency and welfare. The exclusion of Australia from access to European markets did much to accelerate the welfare concern. Since that time policy has gradually shifted from a focus on supporting farmers to remain in farming to a combination of mainstreaming farm welfare within the welfare provisions available to other citizens, and a dismantling of price support and stabilisation schemes (Botterill 2002; Botterill 2003). Despite these changes, and despite 30 years of rural adjustment schemes, Australian agriculture is still characterised by large numbers of small farms. As mentioned earlier, the smallest 50 per cent of farms produce only 10 per cent of the value of production. Should we be as concerned about this situation as economists and policy makers were in the 1970s and 1980s? I believe there are a number of reasons why we should be less concerned.

- Compared with 30 years ago, small farms are less likely to be associated with low family incomes. Major social changes have occurred on farms. Off-farm work by farmers is now commonplace. Female participation in the workforce is now the norm, and many farm wives participate outside the farm. Comparison of ABS farm family income data and farm size data at the SLA level within Victoria shows there is no clear relationship between the median farm size within an SLA and the median farm family income (Barr 2002b; Barr & Karunaratne 2002).

- The large number of small farms in Australia occupy a relatively small area of the landscape. The financially largest 50 per cent of Australian farms occupy 75 per cent of the farm area in Australia. More importantly, the small farms are not spread homogeneously across the farming landscape. Many are concentrated in areas along the Great Dividing Range, or the near the coast. There is no real prospect of farms in these areas ever being aggregated into larger 'viable' businesses. This is because of high land prices reflecting the amenity of living in these areas. Land that is close to major urban centres, has good views, is close to water or has a benign climate attracts migrants from the town. Research in the United States has shown that landscape amenity is strongly related to rural area population change (McGranahan 1999b). In landscapes with few widely valued amenity characteristics, agriculture remained the dominant economic activity and population decline was the norm (McGranahan & Beale 2002). In landscapes dominated by small farms, farm aggregation could only occur if catalysed by politically impossible planning rules that curtailed the right to a housing permit on all new subdivisions.

Despite the high land prices in desirable rural landscapes, some farm businesses do manage to purchase additional land. The business risk of this path is high. Another option is to sell the land and purchase in another area where land prices are lower. For most farm families this is an unattractive option. The common choice is to continue farming in the current location. Other paths to productivity that do not require land purchase may be explored. Improved grazing management or irrigation development is commonly considered. Younger farmers will take off-farm work. Older farmers with high equity in their business can absorb the declining terms of trade. Their easiest course of action is to remain in farming for as long as they are healthy and able to enjoy it. Of course, there is little real hope of passing on the farm to the next generation. These latter choices inexorably drive the path of farm adjustment towards an ageing farm population and a non-commercial agricultural future. Again, this pattern is not new.

*"With all the drift to the country that we hear about today, it is a drift of men quite well along in years, and not a movement which takes the boys and young men back to nature"*  
(Bowsfield 1914)

The research recounted in this report shows a deferral of retirement by increasing numbers of older farmers and the increasing proportion of farmers being replaced by new farmers rather than having their properties purchased by neighbours. Whilst the long-term outlook for farming businesses in these communities is bleak, the prospects for sustaining community population and services is much more positive. In a sense, it is the sustainability of the community population that threatens the long-term viability of agriculture.

These farming landscapes dominated by small farm holdings are often also landscapes with an older farm population. Many of these now older farmers may have once been younger farmers unable to follow their dreams of a career in farming. Later in life they are making a decision to follow their dreams, maybe to escape the city, much as the Dalesman described in his two centuries old Litany of escape from the industrial mills of Yorkshire.

*But now that our children have all gone  
To the country we've come back  
There's forty miles of heathery moor  
'Twixt us and the coal pits slack  
And as I sit by the fire at night  
I laugh and shout with glee  
From Hull and Halifax and hell  
The good Lord delivered me.*

### **Will all these newcomers limit our right to farm?**

Australia is urbanising at an accelerating rate. It is inevitable the culture of farming will have less and less influence upon Australian social values. We are now seeing an escalation of demand for 'multi-functionality' from land and water resources. Multiple functions include improved protection of old-growth forests, improvements in the quality and quantity of water supply, improved health of riverine habitats, 'clean' food and landscape amenity (Cocks 1999b; Ellyard 1998a). Again, Australia is reflecting international trends. In the ecological economics literature there is an on-going debate about the nature of the 'Environmental Kuznets Curve'. Researchers have demonstrated a strong relationship between economic development, reforestation and ecosystem protection (Bimonte 2002; Pasche 2002; Rothman 1998; Rutel 1998).<sup>1</sup>

The greatest influence of urban environmental preferences on the agriculture sector is in the high price of land in the more amenable and accessible parts of the rural landscape. In districts where there is an amenity demand for land, higher land prices are likely to lead farmers to eventually feel constraints upon their license to operate, often resulting in public debates about the 'right to farm'. Individual farming families also can greatly benefit from increasing land values. Though farming may have provided only a modest living, the prospect of subdivision means retirement may well be quite comfortable. Understandably, representatives of the various farmers' federations are expected to fight to maintain for farmers the right to subdivide. But those same federations are also asked to fight for the right to farm. The two claimed rights are to a degree in conflict.

Higher land prices and the market for small sub-economic farmlets is in part a reflection of some prospective purchasers' unrealistic assessment of their prospects within farming. But more commonly it is based upon perceptions of rural life characterised by a quiet and safe enjoyment of their new domain. Sometimes these expectations are not compatible with existing agricultural practices. Farming can be odoriferous. It can be noisy. And it can detract from landscape visual amenity. These expectations of peace, safety and amenity will be expressed in the price being paid for newly subdivided land. How realistic are these expectations? In the case of a planned new piggery or other intensive animal facility, concern for amenity is quite reasonable. In the case of an existing dairy milking shed, there can be quite differing perceptions of reasonable expectations of local amenity. Both sides perhaps need to exercise a degree of compromise in their positions. New residents who have moved into an existing farming environment might need to temper their expectations. But farmers need also to appreciate that it is these new residents and their aspirations that are building the value of their land asset.

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<sup>1</sup> The current debate over the environmental Kuznets curve focuses on whether it reflects a reduced environmental impact or the capacity of the developed world to use environmental power to transfer environmental costs elsewhere in the world (Lindmark 2002; Rothman 1998; Suri & Chapman 1998; Unruh & Moomaw 1998; Vincent 1997).

## What will this mean for our capacity to protect the rural environment?

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The demographic trends described in this report may influence not just the capacity and willingness of farmers and other landholders to protect natural resources, but also which natural resources we believe are worth preserving. Australia's rural land is following divergent transformations of agriculture and society according to location, amenity and landscape. A quarter is progressing along what some researchers have called a 'post-productivist' trajectory. These are the landscapes of high amenity and attractive location, closer to major population centres. The farms of this landscape are generally small. The peri-urban, southern hill country, coastal Queensland and northern beef regions occupy much of this landscape. The other seventy-five per cent of Australian farmland is more likely to remain within the realm of commercial agriculture, where business managers continue to race against the terms of trade. This land is generally drier, flatter and more remote.

Our history has placed us in a good position to understand the drivers of change in this landscape. The main agricultural advantage of these areas to farmers is not better soils<sup>2</sup>, or better rainfall, but the lack of competition from other land purchasers. Increased productivity will be achieved with increasing farm scale. The counterpoint to this productivity and innovation is a continuing trend of depopulation of the hinterland and growth of a limited number of regional centres. This decline is an inevitable outcome of competitive pressures towards aggregation in agriculture, the de-coupling of the farm sector from small town economies and the absence of other industries within these landscapes (Stayner 1997b). The decline of small to middle sized country towns in cropping areas is a continuing source of anxiety for both town and farm residents, and for understandable reasons. It is these small towns have in the past provided the social networks of the cropping communities. The relentless search for productivity on cropping farms fuels the decline of small towns.

Declining population and shifts in the broader labour market will make labour efficiency an increasingly important goal of farm managers. The pool of 'discretionary' labour available for environmental activities will continue to decline. This means land management practices that are labour intensive may become less attractive to land managers. For each hectare in this commercial farming environment, there will be less available time for landcare labour with each passing year.

Farming practices that might provide social benefits beyond the farm (such as biodiversity protection, water supply generation) will generally continue to be adopted if they are labour efficient and profitable, if they are required by regulation or they are purchased as environmental services.

In the quarter of Australia's landscape that will be dominated by small farms and farmlets, the future of land use is unlikely to be broadacre agriculture of the past. Existing farms are generally locked into a slow decline in economic power as the terms of trade compress. When farmers cease their occupation, there is little likelihood of an inter-generational transfer. This lack of intergenerational transfer is already apparent in parts of the Australian landscape (Curtis, MacKay, Van Nouhuys, Lockwood, Byron, & Graham 2000a). Subdivision to the statutory minimum block size will be an attractive prospect for many families inheriting land but with no inclination to live on this land. Newly subdivided properties will often be purchased by in-migrants. People will increasingly be choosing to live in this landscape rather than to live off the landscape. We should expect farm management practices in these areas to be less and less influenced by the need to generate a cash flow from the land.

One can see a new settlement pattern is already emerging in some of these landscapes. Amenity and statement housing are gradually populating hills. Each house has a view a long drive and often makes a statement about the owner to those looking up from the valley. The flats away from any water bodies may at this stage remain in traditional farming ownership. This developing landscape is not unique to this catchment, state or country. Research in North America is describing the evolution of these landscapes (Paquette & Domon 2001).

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<sup>2</sup> It is possible to argue that the growing dryland salinity problem in this zone means the soils are far less suitable for cropping than was first envisaged.

Of interest to us the biophysical landscape that will evolve with this new settlement pattern. There are a number of landscape trends we could anticipate:

- The current farm population worries of the development of a weed wasteland. Following the recent drought in south eastern Australia, there has been much local discussion of the colourful transition of the hill country through yellow in spring to a later deep purple of Paterson's curse. Is this just the beginning?
- Social research in the region has found no relationship between the size of rural properties and the area of purposeful establishment of trees (Curtis & Byron 2002; Wilkinson & Cary 1994). One interpretation of this is that the extent of tree planting and re-establishment of tree cover will increase as the cadastral base is fragmented in to smaller and smaller holding. New entrants to the landscape may be as much driven by the desire to improve the biodiversity stocks of the land as to farm. Certainly most will be aiming to improve their local landscape amenity through aesthetic tree planting in proximity to the property dwelling. Some may be more driven by land for wildlife than land for sheep or cattle. Whether this is further enhanced by natural regrowth on 'abandoned' land will depend upon success in control of rabbits. Success will more and more depend upon outside intervention.
- The Canadian research of rural landscape fragmentation describes the development of a leasehold farming system in which the traditional farm businesses of the lower landscape utilise the hillside land of the new population. This provides a simple commonality of interest for both parties, as long as the farming practices do not detract from the amenity of the landscape nor the housing statement they have made about themselves. (Paquette & Domon 2003). However, this leasing arrangement is seen as a transitional state as the older generation of producers in the valleys retire.

Some of these 'post-productivist' landscapes are in high recharge locations. Many more will be in high water yielding landscapes. This provides a challenge for the usual prescription of recharge control using plant-based interventions. It is extremely unlikely that profitability alone will encourage sufficient adoption of perennial to induce a change in the hydro-geological processes of the region. The only realistic prospect for more skilled and intensive management of the land (ie. leasehold farming by profit-oriented producers) is not likely to be widespread. A major restructuring of farm establishments into larger and more commercially focussed holdings is even more unlikely. Despite the gentle lamentation of the passing of inter-generational transfer of farming in the area, there is no will, even on the part of the farming community, to implement the planning policies that might encourage such a commercial restructuring.

Landscape changes involving extensive reforestation are potentially threatening for both existing farmer residents and new arrivals. For new arrivals there is a tension between their fondness for trees and their need for views, both of which contribute to the amenity for which they moved into the area. Too many trees and, not only are their panoramic views compromised, but also the visibility to others of their housing statement. For long-time residents there is a resistance to dramatic change in the landscape with which they have grown familiar. And the skills of the local farmers are in agriculture and, particularly among the ageing, are unlikely to be adapted to silviculture.

In this context, we can infer a few of the characteristics of any plant-based system that might be successful in managing salinity recharge.

- It will be able to be reliably and cheaply established in highly acidic soils, such that a lessee with a short term (possibly uncontracted) leasing arrangement or a landholder with little interest in production would be willing to invest in establishment.
- It will be easy to manage and will flourish under the conservative set-stocking regime typical of much of the agriculture remaining in the region.
- It will be indigenous to the area, or at least native, lest it be perceived as a weed and interpreted as an imposition upon the environmental amenity by those attempting to re-establish what they see as a more natural landscape.
- It will not detract from landscape amenity.
- It will be able to reduce recharge by a substantial amount, compared with current systems.

This is quite a challenging design brief for the scientists and politicians of the new paradigm.

In closing the previous report in this series, we concluded with some musings on the realistic pace of landscape change in rural Australia. Five years have passed since we typed those words. Five years is but a small span in the scale of the task of landscape change and rehabilitation that Australia seems to be setting as one of its social goals. The message of five years ago is still as adequate to conclude a report of this kind as it was then. Rather than frame a new message, we have chosen to conclude by repeating the words of five years ago.

The task of improving catchment health, particularly reducing the predicted future impacts of salinity, is a massive undertaking. A sustainable long-term solution implies significant and major changes in catchment landscapes. If we look at this task in short time frames, it is easy to become overwhelmed. History tells us that societies do not achieve such massive changes in landscape in short time frames without social disruption. Past expectations of the farm sector achieving salinity control through the actions of current landowners have been generally accepted as unrealistic. Major injections of government funding through the Salinity National Action Plan will greatly enhance the capacity of landholders to accelerate the rate of change. But it is hard not to still form the opinion that the task will still appear enormous following the expenditure of these funds. Is this a cause for pessimism? No.

We must accept that any challenge of achieving significant land use change is a task for more than one generation. Land use change is always occurring, and in most cases this change is being driven by economic and social factors unrelated to natural resource management policy. The challenge is to identify these trends and harness them where opportunities exist to achieve improvements in natural resource management and catchment condition. Natural resource management policy advisers and catchment managers need to keep in contact with in catchment structure, economies, markets, technologies and social forces.

In the meantime, incremental change that can be shown to have positive outcomes remains a valuable investment. Incremental change is being achieved. This is the strength of the Landcare movement (Cary et al. 2001). Where we can invest in incremental change, with a confidence in capturing positive environmental and social outcomes, we should invest, even while acknowledging the desirability of long-term catchment landscape change.

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## Appendices

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### Appendix 1: Data sources and entities

#### *The Australian Census of Population and Housing*

The Australian Bureau of Statistics Census of Population and Housing (CPH) is conducted Australia-wide at five-yearly intervals. The CPH provides information about individuals who describe their main occupation as farming, as well as information about the families and households associated with farmers.

The most recent Census of Population and Housing was conducted in 2001. Much of the analysis in this report is based upon data from the most recent census. However, trend information is derived from the 1976, 1981, 1986, 1991, 1996 and 2001 censuses. For some indicators this can provide trends over a 30-year period from 1971 to 2001.

#### *The Australian Agricultural Census*

During the period 1983 to 1997, the Australian Bureau of Statistics conducted an annual farm census of all Australian farming businesses meeting a minimum gross income criterion. Then followed a four-year gap until next census was conducted in 2001. All farm business operators are required by law to complete and return the Agricultural Census form. The Australian Agricultural Census (AAC) contains a series of questions on farm production items and management techniques. Data from the census is reported by farm establishment. In 2001 the ABS introduced a small number of demographic questions to the AAC. One of these was designed to determine the occupational status of establishment managers.

This report uses data derived from the Australian Agricultural Censuses conducted between 1983 and 1997 and that conducted in 2001.

#### *Australian Farm Survey*

Some background information was derived from the annual farm survey reports produced by the Australian Bureau of Agricultural and Resource Economics (ABARE 2001).

#### *Data geography*

Data from the ABS is not made available in a manner that enables the identification of individuals or single families. It is published in aggregated format. Much of the data presented in this report is aggregated at national level. Where there is significant geographic variation, maps have been produced to display this variance. These maps have been based on Statistical Local Area (SLA) geography. SLAs are geographic regions used by the ABS to report summarised aggregated data (Australian Bureau of Statistics 2001). SLAs are based upon Local Government Areas (LGAs), with one Local Government Area encompassing from one to five or more SLAs. SLA boundaries change in response to changing population distribution and changing administrative boundaries.

Major changes in LGA boundaries in the past decade have caused major changes to some SLA and SSD boundaries. PHC-derived indicators presented as maps in this project have been presented aggregated at 2001 SLA and SSD boundaries. PHC data is available in two forms, 'enumerated' or 'usual residence'. Enumeration data counts persons according to their location on census night. Usual residence data counts persons according to their stated location of usual residence. The study of migration patterns is best undertaken with Usual Residence data. The ABS is able to provide enumerated data for past Population and Housing Censuses based on current SLA boundaries. It is unable to do this for usual residence data or for data derived from the Australian Agriculture Census. This necessitated data used to build regional trend indicators to be concorded to match 2001 geography. Our concordance was based upon a pro-rata allocation according to area of agricultural land. Area of agricultural land was derived from a data set created by the Bureau of Rural Science for the National Land and Water Resources Audit (Bureau of Rural Sciences 2001).

### ***Defining a farmer***

The major entity enumerated within the CPH is the individual. Three questions on the census form seek information about the occupation of respondents. In the 2001 form question 33 asked:

“In the main job held *last week* was the person:

- A wage and salary earner?
- Conducting own business with employees?
- Conducting own business without employees?
- A helper not receiving wages?”

In the instructions respondents are advised that “if the person had more than one job last week, then the ‘main job’ refers to the job in which the person usually works the most hours”. They are then advised to read page 11 of the census Guide for further information.

Question 34 asked:

“In the main job held *last week*, what was the person’s occupation?”

Question 35 asked:

“What are the main tasks that the person himself or herself usually performs in that occupation?”

Answers to these three questions are used to code an occupation for each census respondent using the Australian Standard Classification of Occupations. Persons whose main occupation is the management of a farm are coded with code 13 – Farmers and Farm Managers. Skilled agricultural workers including farm overseers are coded to classification 46. Agricultural labourers are coded to classification 992.

Whilst the three questions used to make these classifications may seem straightforward, there are good reasons to examine the meaning of farmers’ answers to these questions. Off-farm income is not a new phenomena in Australian agriculture (Barr & Almond 1981; Core 1974; Paul 1982). However, more recent studies have shown that off farm income has become increasingly important to the farm household, particularly during periods of low commodity prices (Rasheed, Rodriguez, & Garnaut 1998). Average off-farm income has risen consistently in broadacre agriculture over the past 20 years from \$6,000 to \$20,000 per farm per annum in real terms (Garnaut & Lim-Applegate 1998).

For many persons working in agriculture, farming is felt to be not just an occupation but a way of life. Strong occupational self-identity may influence responses to question 34 where the respondent is a farmer and working in more than one job. How do these farmers decide whether farming is their main occupation during census week? The clarifying instructions within question 33 say that the main job is the one in which most hours are usually worked. The crux of this advice is the word ‘usually’. Does this refer to a week, a month, and a year?

Seasonal off-farm work is quite common in some agricultural industries. The main workload of harvest for many horticultural businesses falls in the summer and autumn. Other seasons can be much less labour demanding and owners of small horticultural blocks will often use this period to earn off-farm income. From the perspective of annual income and annual time commitment, farming may well be the main occupation. However, farming may not be the main occupation during census week, month or quarter.

A farmer working the majority of hours in an off-farm job in the census year may believe that the census year is atypical due to seasonal problems or low commodity prices. At the most extreme, a wool producer may have believed that the prolonged period of low wool prices during the 1990s was an aberration and that he or she is usually a wool producer, though he or she has worked the majority of hours per week in an off-farm job for a number of years.

A strong sense of identification with farming may encourage farmers in the situations described above to nominate farming as their main job despite working more hours in a non-farm job during census week. These matters are explored in more detail in a related publication (Barr 2004b).

### ***Farm Families and Farm Households***

A family is defined by the ABS as “two or more persons, one of whom is at least 15 years of age, who are related by blood, marriage (registered or de facto), adoption, step and fostering and who are usually resident in the same household”. For the purposes of our research, we defined a farm family as an ABS defined family, at least one of whose members describes this or her main occupation as farming.

The ABS defines a household (or dwelling) as a group of two or more related or unrelated people who reside in the same household, who regard themselves as a household, and who make common provision for food or other essential for living, without combining with any other person. We defined a farm household as any ABS defined household, at least one of whose members nominates farming as their main occupation. In practice, the choice of whether to use farm household or farm family data is of limited importance. Households of unrelated individuals that include one farmer are quite uncommon. In 2001 the ABS CPH counted 139,530 farm families and 138,710 farm households, a variation of only half a per cent.

### ***Agricultural Establishment***

For the Australian Agricultural Census the concept of an establishment is the same as that used by the ABS for all activity statistics collections. In the Agricultural collection the establishment is the smallest accounting unit of business within an SLA, controlling its productive activities. In general an establishment covers all operations at a physical location, but may consist of a group of locations provided they are within the same SLA. The majority of establishments enumerated in the AAC operate at one location only and can generally be assumed to correspond with what is generally seen to be a farm business.

### ***Estimated Value of Agricultural Operations***

The ABS uses production data to measure of the relative size of agricultural activity of each establishment. The ABS developed this measure, the Estimated value of Agricultural Operations (EVAO), to make a distinction between holdings that should or should not be included in its agricultural collection and to classify establishments into industries. Prices used to create the EVAO are derived from many sources. The EVAO is created using a three-year weighted average to smooth volatility in the measure.

Between 1984 and 1997 the minimum EVAO required for inclusion within the census has varied inconsistently from \$2 500 to \$22 500 according to budgetary pressures on the ABS. A higher cut-off reduces the number of census forms that need to be circulated in the following census. The minimum value for inclusion in the AAC has remained at \$5 000 (nominal) since 1993/94. In 2001 this cut-off produced a count of 140,516 establishments. Not all of these establishments were part of a business whose main industry was agriculture. When these non-agricultural establishments are removed, the count of agricultural establishments was 138,917.

The variable EVAO cut-off is complicated by the impact of inflation and changing commodity prices on farm EVAO. As an example, the fall in wool prices in the late 1980s resulted in the exclusion of many small wool properties from the AAC when the gross value of their farm production fell below the EVAO cut-off. Further, between the 1993/94 and the 2001 AAC, inflation has reduced the purchasing power of an Australian dollar by 18 per cent, effectively changing the real value of the cut off EVAO. This implicit change in the cut-off EVAO would have little impact on estimates of the total scale of production. It will have a greater impact upon the less frequently used count of establishments. The distribution of farm establishments according to EVAO is quite skewed with a large number of establishments having low EVAOs.

## **Appendix 2: The regional classification**

In order to make clearer some of the structural differences in agriculture across Australia a classification analysis of agricultural Statistical Local Areas is used to report regional variation in indicators. This analysis was created as part of a project funded by the National Land and Water Resources Audit. The creation of this classification is described in greater detail in Barr (2001). The classification contains 12 non-contiguous groupings of Statistical Local Areas, clustered according the farm population and industry structural characteristics.

**Peri-urban:** This cluster consists of Statistical Local Areas clustered around many major cities (see Melbourne, Sydney, Adelaide and Perth) as well as around some major regional centres (such as Shepparton). These Statistical Local Areas have a heterogenous mix of small sub-commercial grazing enterprises, as well as significant highly intensive industries such as vegetable production. Farm family incomes are higher than average due to the small number of high turnover intensive establishments and the high off farm income of those living on sub-commercial grazing properties. Less than 5 per cent of the workforce nominate agriculture as their main occupation. Half of the agricultural land is not reported to the Australian Bureau of Statistics farm census.

**Closer settled grazing:** This group includes Statistical Local Areas in northern Tasmania, southern Victoria, Victorian irrigation areas, the lower Murray, coastal land south of Perth, the upper Hunter and the Duaringa Shire in Queensland. Many of these regions have a history of more intensive closer settlement. Dairying is the

most common industry in many of these Statistical Local Areas. Despite the small area occupied by these Statistical Local Areas, there are over 20,000 farm establishments in the cluster.

**Southern Hill Country:** These Statistical Local Areas are generally found along the Great Dividing Range stretching from northern NSW to western Victoria. There are many small farms, with only 8% of establishments having an Estimated Value of Agricultural Operations greater than \$300,000. Despite the small farm sizes, farm family incomes are little different from other regions, indicating a high dependence upon off-farm income. Beef and wool production are the predominant industries.

**Coastal Queensland:** These are small Statistical Local Areas scattered along the coast of Queensland coast. Fruit, vegetables, beef and sugar production are the most common industries. Despite the small area of these Statistical Local Areas, there are over 5,000 establishments.

**Northern Irrigated Cropping:** This cluster includes the Emerald, Darling Downs, Balonne, Narrabri and Moree districts in northern NSW and southern Queensland. These regions are typified by higher value cropping enterprises including cotton and rice. Many of these communities are dependent upon irrigation, or are becoming increasingly dependent on irrigation.

**Mixed farming heartland:** This cluster includes much of the dryland farming area of the Murray Darling Basin, the Eyre Peninsula and the westerly section of the WA cropping belt. Farms here fall into mid size ranges. Wool and cereal cropping are dominant industries. Agriculture accounts for over a quarter of the regional workforce. This region has the highest proportion of farm establishments with Estimated Value of Agricultural Operations between \$100,000 and \$300,000.

**Southern Irrigated cropping:** These Statistical Local Areas lie within NSW and are heavily dependent upon irrigation from the Murray and Murrumbidgee. The farm culture is a mix of traditional broadacre industries as well as irrigated crops such as rice.

**Irrigated Horticultural Settlements:** These Statistical Local Areas include the Riverland, Swan Hill, Sunraysia and Griffith regions. Many farm businesses in these Statistical Local Areas are irrigated fruit blocks. Major commodities are grapes and other fruit. Only 10 per cent of the workforce nominate agriculture as their main occupation.

**Rangelands:** This cluster includes many Statistical Local Areas within the rangelands region of Australia. The majority of these businesses have gross incomes greater than \$300,000. These larger businesses managed the majority of the grazed land. The low ratio of farm families to farm establishments indicates the presence of a larger than average number of corporate farms with often unmarried management and employees.

**Northern Beef Zone:** This cluster includes many Statistical Local Areas in inland SE Queensland or northern NSW as well as parts of the Gascoyne Murchison. Beef production is the predominate industry. This zone differs significantly from the rangeland cluster because of its generally smaller farm sizes. Together with the mixed farming heartland, this cluster has the lowest farm family income average over the 1986,91 and 96 censuses. Despite having similar farm sizes to the high rainfall beef region, the capacity to earn off-farm income is possibly lower in this region.

**West Australian cropping zone:** This is the most recently settled part of the West Australian wheat belt. This cluster has the highest average farm gross incomes, and the highest proportion of the landscape managed by large farms. Farm family incomes are little different to the Australian average, indicating a lower dependence upon off-farm work and high dependence upon farm income.

**Tropical horticulture:** This is a small number of Statistical Local Areas, which includes the Ord region, Carnarvon and Mareeba. These Statistical Local Areas have a mix of rangeland and horticultural industries. In effect, each of these Statistical Local Areas contains very different landscapes, which would belong in quite different clusters if Statistical Local Area boundaries more closely aligned industry variations.

Table 1 Establishments, farmers and farm families in each cluster region

Region	Total establishments with EVAO greater than \$5k (1996\$) in 1996	Total Farmers in 1996	Total Farm Families in 1996
Peri-urban	12,031	21,097	11,537
Closer Settled Grazing	22,332	33,842	16,919
Southern Hill Country	24,329	26,253	13,753
Coastal Queensland	6,386	8,538	4,574
Northern Irrigated Cropping	4,415	6,001	2,846
Broadacre heartland	28,866	38,268	19,098
Southern Irrigated Cropping	2,912	4,334	2,130
Irrigated Horticultural Settlements	6,164	7,358	4,059
Rangelands	2,002	3,067	1,116
Northern Beef	19,814	22,589	11,118
West Australian Cropping	4,834	7,940	3,462
Tropical Horticulture	815	1,303	569

Table 2 Agricultural industries by cluster region averaged over Statistical Local Areas within each cluster

Region	Establishments with industry as a % of all establishments in 97										
	Sheep	Wool	Beef	Dairy	Cereals	Grapes	Other Fruit	Vegetables	Rice	Cane	Cotton
Peri-urban	13	12	27	8	8	4	18	23	0	0	0
Closer Settled Grazing	18	17	49	50	10	2	4	7	0	0	0
Southern Hill Country	67	66	68	6	33	2	3	3	0	0	0
Coastal Queensland	0	0	28	3	0	0	20	11	0	High	0
Northern Irrigated Cropping	27	25	60	5	76	1	1	1	0	0	22
Broadacre heartland	85	83	39	2	73	2	1	2	0	0	0
Southern Irrigated Cropping	63	60	48	5	78	3	5	3	47	0	0
Irrigated Horticultural Settlements	18	17	9	2	16	63	39	6	2	0	0
Rangelands	19	19	90	0	5	1	1	2	0	0	0
Northern Beef Zone	22	22	75	11	32	1	7	6	0	0	1
West Australian Cropping	88	87	17	0	94	0	0	0	0	0	0
Tropical Horticulture	6	6	20	1	6	3	64	35	0	Moderate	1

Table 3 Some structural characteristics of cluster regions averaged over Statistical Local Area within each cluster

Region	Ratio of establishment area to agricultural area 1996	% workforce with agriculture as main occupation 1996	Ratio of farm families to establishments in 1996	Median EVAO (5k cut-off) 1996 in 1996\$	Establishments with EVAO less than \$32k as a % of establishments with EVAO above \$32k in 1996	% Establishments with EVAO between \$32k and \$100k in 1996	% Establishments with EVAO between \$100k and \$300k in 1996	% Establishments with EVAO > \$300k in 1996	% of farm establishment area held by establishments with EVAO greater than \$300k in 1996	Median farmer age 1996	Average median farm family income 86,91,96	Average % families with income less than \$20k 1986,91,96	Average % families with income > \$50k 1986,91,96
Peri-urban	50	4	200	65	67	45	33	22	21	48	40	36	17
Closer Settled Grazing	93	14	116	86	49	36	47	16	24	48	36	31	22
Southern Hill Country	100	13	96	56	59	57	34	9	18	52	34	28	24
Coastal Queensland	100	9	93	117	32	33	48	20	32	50	37	34	21
Northern Irrigated Cropping	100	19	79	143	22	31	36	33	42	47	32	29	29
Broadacre heartland	93	27	76	157	13	28	50	21	38	47	29	24	31
Southern Irrigated Cropping	100	27	81	172	11	22	48	30	56	47	31	27	32
Irrigated Horticultural Settlements	87	12	81	95	29	45	41	14	34	47	37	32	21
Rangelands	100	10	56	350	8	11	30	58	76	47	38	33	23
Northern Beef Zone	100	20	83	89	51	44	38	17	24	49	28	22	34
West Australian Cropping	82	33	76	388	3	8	30	62	79	44	35	34	25
Tropical Horticulture	91	9	76	147	17	24	47	29	76	47	42	41	17

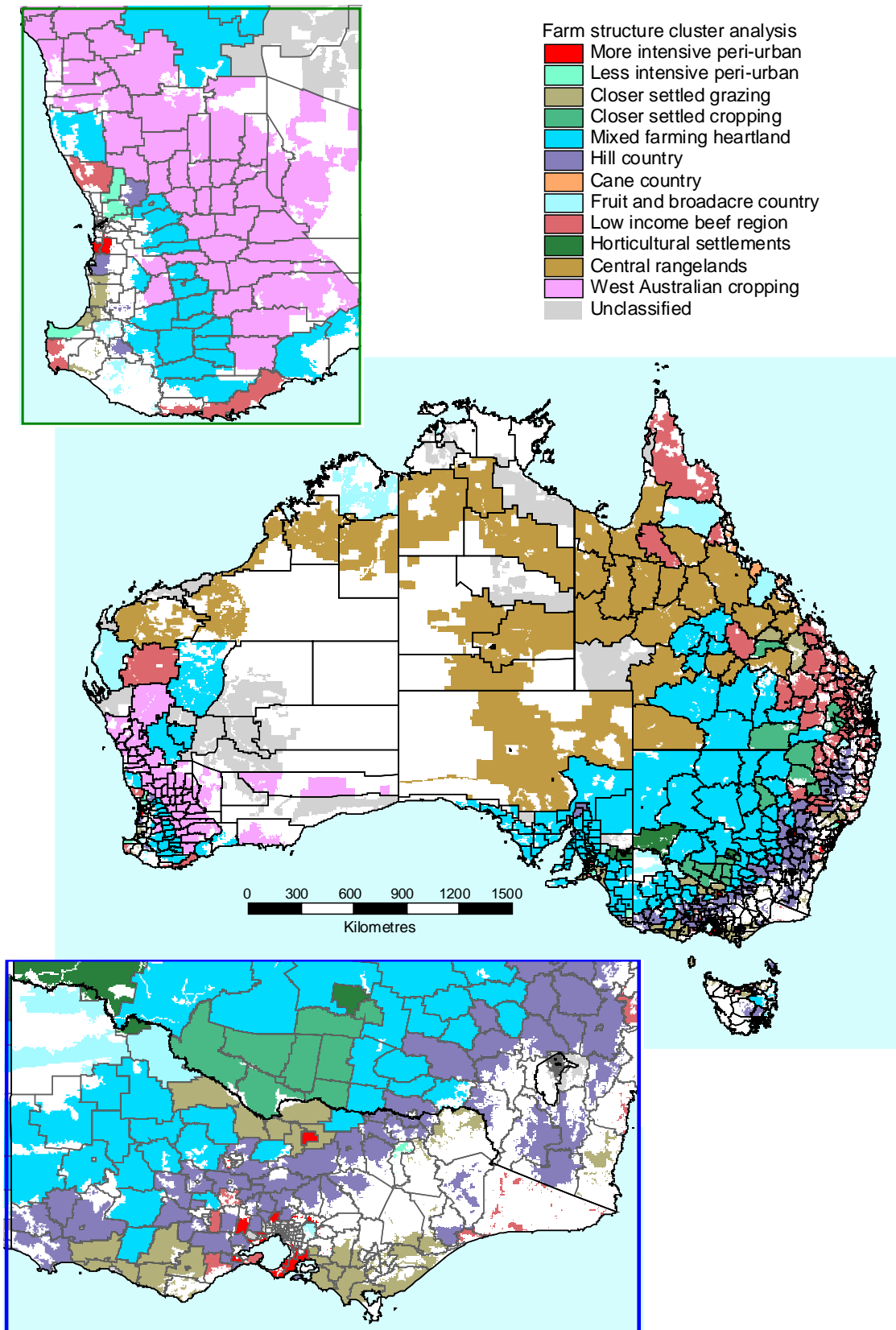


Figure 38 Map of agricultural regions derived by cluster analysis of Statistical Local Areas (Part A)

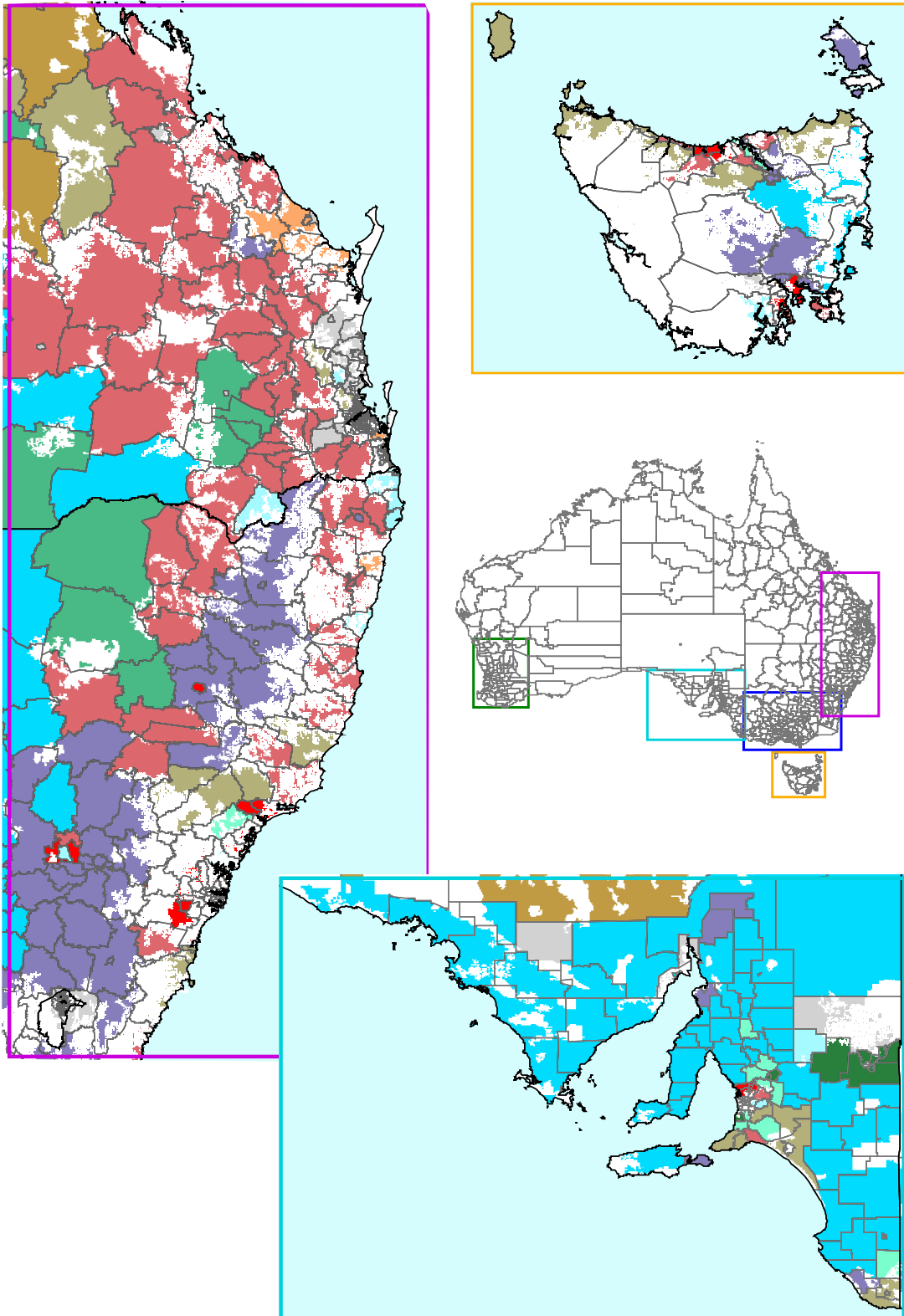


Figure 39 Map of agricultural regions derived by cluster analysis of Statistical Local Areas (Part B)