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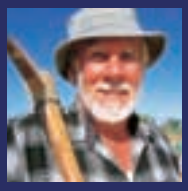
Australian Bureau of Statistics

2001 census

The Micro-Dynamics of Change in **Australian Agriculture:** 1976-2001



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AUSTRALIAN CENSUS ANALYTIC PROGRAM

Australian Census Analytic Program

The Micro-Dynamics of Change in Australian Agriculture

1976 – 2001

Neil Barr

Department of Primary Industries

Victoria

AUSTRALIAN BUREAU OF STATISTICS

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INQUIRIES

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- The many Australian 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.
- Colleagues Roger Wilkinson, John Cary and Komala Karunaratne with whom I have often discussed demographic change within Australia's farming community.

Neil Barr
Centre for Land Protection Research

February 2004

ABBREVIATIONS

The following abbreviations have been used throughout this publication.

AAC	Australian Agricultural Census
AAS	Australian Agricultural Survey
ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACAP	Australian Census Analytic Program
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ASCO	Australian Standard Calssification of Occupations
CPH	Census of Population and Housing
DRDC	Dairy Research and Development Corporation
EVAO	Estimated Value of Agricultural Operations
FMTF	Family Type
FNOF	Family Number
FRLF	Relationship between Families
HHTD	Household Type
LGA	Local Government Area
MV5D	Household Five Year Mobility Indicator
OCCP	Occupation
QDNRE	Queensland Department of Natural Resources and Environment
QDPI	Queensland Department of Primary Industries
SSD	Statistical Subdivision
SLA	Statistical Local Area
UAI5P	Usual Address 5 Years Ago Indicator
US	United States
USA	United States of America

SUMMARY

This report is about the changing demographic structure of Australia's farm community. It examines patterns of entry to agriculture and exit from agriculture, and uses these to build a simple model of the farm sector. The model is used to project possible future farming population structures. These projections are used in a brief discussion of the nature of social sustainability in the Australian farm sector. The report concludes with some observations on the shortcomings of current national collections from the farm sector and makes some recommendations to improve these collections.

Entry to farming has changed little since 1996. After a rapid decline in the entry rate of young persons during 1970s and 80s, entry of younger persons seems to have stabilised at new low levels. The major form of entry is increasingly mid-career, rather than through informal family apprenticeship. The low recruitment of younger persons to agriculture may be a reflection of major adjustment decisions being delayed to the inter-generational transfer period.

Exit rates from agriculture continued to decline between 1996 and 2001, particularly for women and for older persons. It appears that increasing numbers of farmers are choosing to continue to farm on grazing enterprises in the absence of a next generation interested in taking over the business.

The trends in farmer migration meant there was little change in the number of farmers in last intercensal period. However, median farmer age continued to increase, a result not just of declining younger entry, but also of the new phenomena of delayed exit by older persons. Over two decades these trends have dramatically changed the age profile of the farmer population. Since 1976 the number of farmers aged in their 20s has declined by over 60%.

These trends are more pronounced in some industries and landscapes than in others. Whilst the dairy and cropping industries have maintained a relatively young and stable age profile, the two most populated age classes in the beef industry are 50–59 years and 60–64 years. There is some evidence to suggest that the sheep industry is in a progression towards a population profile similar to the beef industry.

Projections using the basic model suggest the ageing of the farm population will peak within 10 years, though this finding is based upon entry and exit behaviour remaining similar to that displayed in the past 15 years. The model projects a wide range of potential population decline scenarios, ranging between 10%– 50% over the next 30 years. There is significant regional variation in these

projections, consistent with the conclusion that some parts of the agricultural landscape are on 'post-productivist' trajectory out of commercial agriculture.

Finally, in an appendix we suggest that some significant improvements can be made to national data collections by addressing the issue of multi-occupationality.

CHAPTER 1 INTRODUCTION

This report is based upon a larger volume produced as part of the National Land and Water Resources Audit (Barr 2001b). In an attempt to portray the dynamic nature of economic and social change within farming communities, the Audit report used data from the Australian Census of Population and Housing (CPH) and the Australian Agricultural Census (AAC) to build indicators and a model of the changing structure of Australian farming communities. This report updates a number of the key indicators used in that report using data from the most recent CPH conducted in 2001.

REPORT STRUCTURE

This report is constructed in four sections:

- Background information on the data sources and definitions used in the project.
- An exploration of the major occupational decisions of farmers. This section describes decisions to exit and enter farming, particularly during the period 1996–2001.
- Changes in the structure of the farmer population. This section summarises the impact of entry and exit decisions upon the number of farmers, their geographic distribution and their age profile.
- Modelling future farm populations. The final section describes a simple model and its use to project possible future farming population structures. Insights from these projections are used to explore some aspects of the social sustainability of farming communities.

CHAPTER 2 STUDY BACKGROUND

DATA SOURCES

Australian Census of Population and Housing

The Australian Bureau of Statistics' (ABS) 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 CPH 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. This results in not just an update, but also a substantial extension of an earlier report commissioned by Land and Water Australia and the National Land and Water Resources Audit (Barr 2001b).

Australian Agricultural Census

During the period 1983–1997, the ABS conducted an annual farm census of all Australian farming businesses meeting a minimum gross income criterion. Then followed a four-year gap until the next census was conducted in 2001. All farm business operators are required by law to complete and return the Agricultural Census form. The 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 AACs conducted between 1983–1997 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 (ABS 2001b) 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 Statistical Subdivision (SSD) boundaries. CPH-derived indicators presented as maps in this project have been presented aggregated at 2001 SLA and SSD boundaries. CPH 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 AAC. 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 dataset 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

(ASCO). Persons whose main occupation is the management of a farm are classified with code 13 — Farmers and Farm Managers. Skilled agricultural workers including farm overseers are classified to code 46. Agricultural labourers are classified to code 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 Appendix 2, in which the following conclusions are drawn:

- Over the past 20 years there has been no change in the relative proportions of male and female farmers across all age groups.
- Because coders for the CPH do not check for consistency between answers for questions 34 and 35, 9% of census respondents coded as farmers and

farm managers (OCCP code 131) are coded with a non-agricultural industry code for question 35. These individuals are saying that farming is their main occupation but that their main job in the past week was not farming. The rate of mismatch is highest in coastal and peri-urban locations.

- 33% of persons coded with farming as an occupation indicated they commuted to work by car or similar means on census day. Farmers holding non-contiguous properties may be commuting to work. However, many of the commuting respondents are commuting to non-farm jobs.
- Between 10%–30% of persons who are indicating farming as a main occupation on the census form were working in another occupation during census week[1].

AN ALTERNATE REGIONAL GEOGRAPHICAL CLASSIFICATION

In order to make clearer some of the structural differences in agriculture across Australia a classification analysis of agricultural SLAs 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 SLAs, clustered according the farm population and industry structural characteristics. A more detailed description of these regions can be found in Appendix 1.

- Peri-urban: This cluster consists of SLAs clustered around many major cities (see Melbourne, Sydney, Adelaide and Perth) as well as around some major regional centres (such as Shepparton). These SLAs 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% of the workforce nominate agriculture as their main occupation. Half of the agricultural land is not reported to the ABS farm census.
- Closer Settled Grazing: This group includes SLAs 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 SLAs. Despite the small area occupied by these SLAs, there are over 20,000 farm establishments in the cluster.
- Southern Hill Country: These SLAs are generally found along the Great Dividing Range stretching from northern New South Wales to western Victoria. There are many small farms, with only 8% of establishments having an Estimated Value of Agricultural Operations (EVAO) greater than

1 Further exploration of these issues can be found in the appendixes to this report.

$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 SLAs scattered along the coast of Queensland. Fruit, vegetables, beef and sugar production are the most common industries. Despite the small area of these SLAs, there are over 5,000 establishments.
- Northern Irrigated Cropping: This cluster includes the Emerald, Darling Downs, Balonne, Narrabri and Moree districts in northern New South Wales 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 Western Australian Cropping belt. Farms here fall into mid size ranges. Wool and cereal cropping are dominant industries. Agriculture accounts for over one-quarter of the regional workforce. This region has the highest proportion of farm establishments with EVAOs between $100,000 and $300,000.
- Southern Irrigated Cropping: These SLAs lie within New South Wales and are heavily dependent upon irrigation from the Murray and Murrumbidgee Rivers. The farm culture is a mix of traditional broadacre industries as well as irrigated crops such as rice.
- Irrigated Horticultural Settlements: These SLAs include the Riverland, Swan Hill, Sunraysia and Griffith regions. Many farm businesses in these SLAs are irrigated fruit blocks. Major commodities are grapes and other fruit. Only 10% of the workforce nominate agriculture as their main occupation.
- Rangelands: This cluster includes many SLAs 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 SLAs in inland south-east Queensland or northern New South Wales 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, 1991 and 1996 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 SLAs, which includes the Ord region, Carnarvon and Mareeba. These SLAs have a mix of rangeland and horticultural industries. In effect, each of these SLAs contains very different landscapes, which would belong in quite different clusters if SLA boundaries more closely aligned industry variations.

SEASONAL CONDITIONS AND MARKET PRICES IN THE CENSUS YEARS

Commodity prices and seasonal conditions during the intercensal period preceding each CPH 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 four intercensal periods.

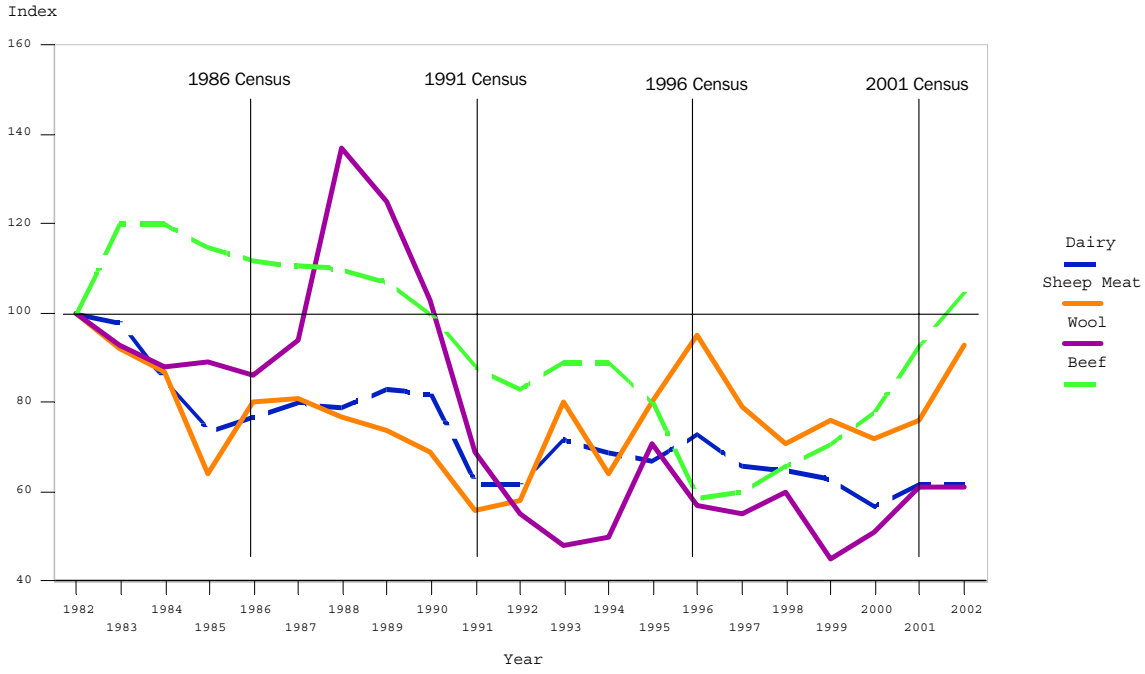
1981–1986: The period leading up to the 1986 census was characterised by generally declining prices for both cropping and grazing industries. The exception was the beef industry that experienced an improvement in real prices. The middle of this period coincided with a severe el Nino event, which resulted 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 (QDPI & QDNRE 2001). Major rainfall deficits were experienced in central Australia, the Gulf country and coastal South Australia. In these areas production will have been depressed (see map 2.3).

1986–1991: The most obvious feature of this period was a major peak in wool and wine grape prices. Most cropping commodity prices showed little overall change over this intercensal 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 intercensal period. Climatic conditions were varied across Australia. During the first two years of the period low rainfall was experienced in southwest 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 Western Australia and much of southeast Queensland. EVAO data from these regions will reflect these climatic conditions with reduced production in both these areas.

1991–1996: This intercensal period was dominated by the period of prolonged low wool prices and a drought in the central New South Wales and southern Queensland wheat belt. Parts of the Darling Downs experienced only one year of average or above average rainfall. The year of the 1996 census saw average rainfall across much of Australia, with above average rainfall in the Darling Downs. Rainfall deficit was experienced in the Eyre Peninsula and much of coastal South Australia. There is remarkable similarity in the climatic conditions prevailing in the years of the 1986 and 1996 censuses (see map 2.3). The breaking of the Queensland drought and a rise in grain prices inflated reported farm family incomes well above that received during much of the intercensal period. Adjustment processes measured in this report reflect the duration of both these difficult conditions during much of the period. In contrast, wine grape prices rose significantly during the same period. Adjustment patterns in grape growing horticultural districts will reflect these buoyant circumstances.

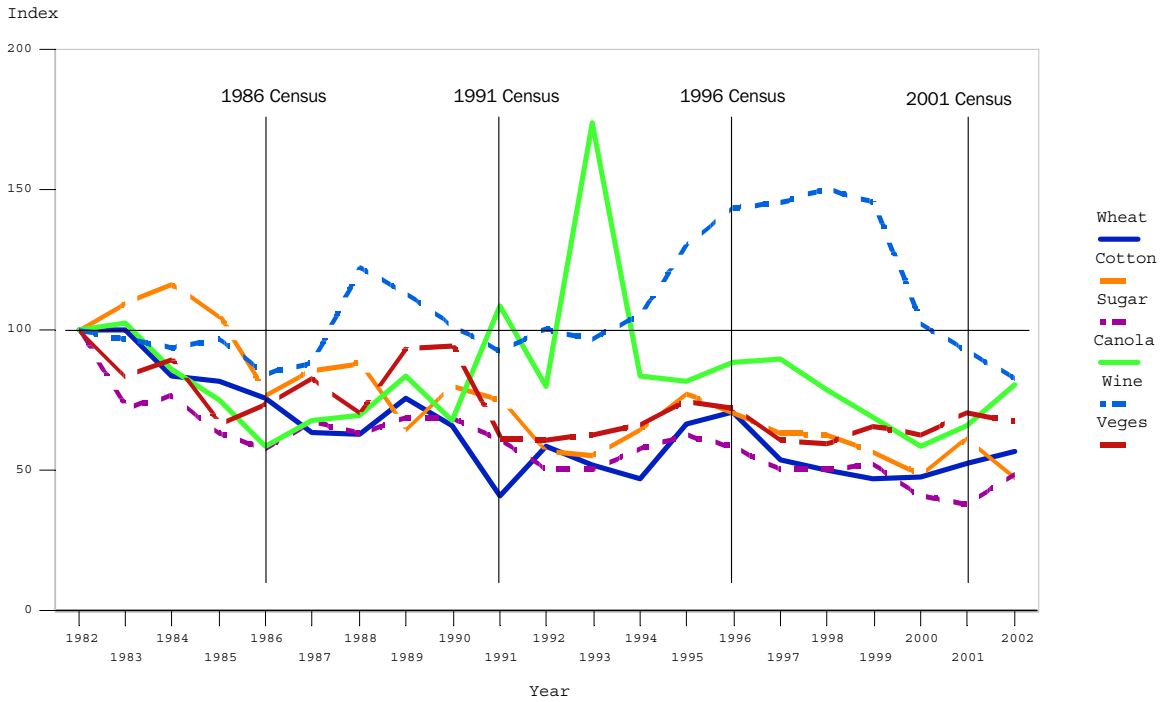
1996–2001: The livestock industries commenced a gradual improvement in fortunes. The price of wool commenced a gradual rise with the final depletion of the stockpile, peaking in late 2002. Unlike the previous price spike, this peak was more pronounced in the broader wool types. During this period there 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 intercensal period coincided with low rainfall for coastal Victoria and parts of southeast Queensland. In the year immediately preceding the 2001 census, these areas and southwest 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.

2.1 INDEXED PRICES RECEIVED BY AUSTRALIAN FARMERS FOR MAJOR ANIMAL PRODUCTION COMMODITIES — 1982–2002 (INDEXED TO 1982=100) AND TIMING OF POPULATION AND HOUSING CENSUSES



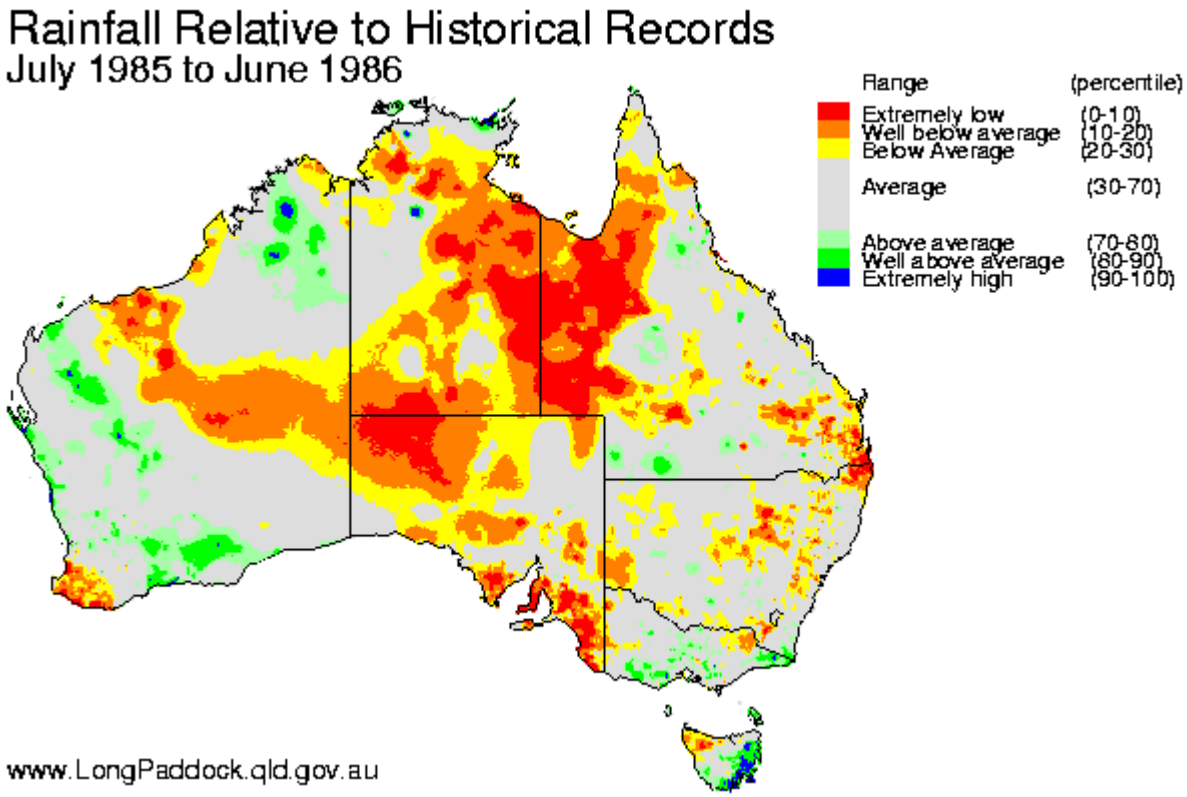
Source: ABARE.

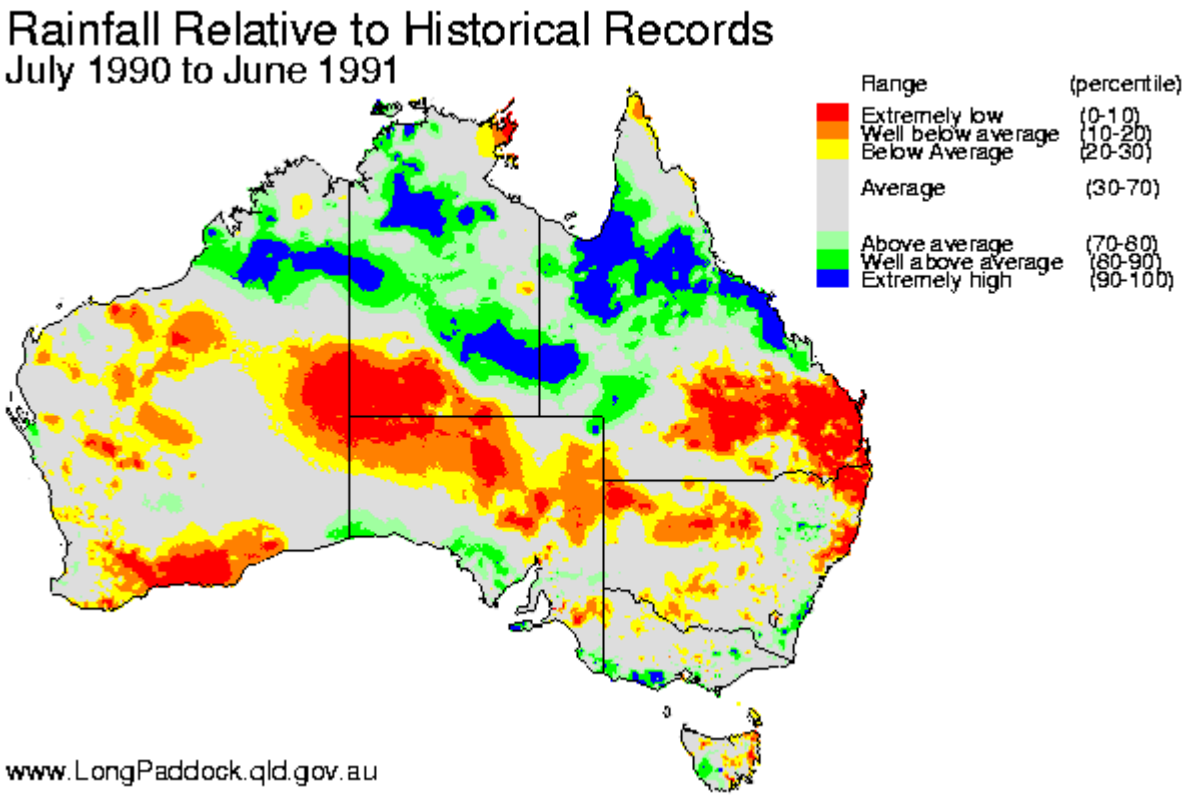
2.2 INDEXED PRICES RECEIVED BY AUSTRALIAN FARMERS FOR MAJOR CROP COMMODITIES — 1982–2002 (INDEXED TO 1982=100) AND TIMING OF POPULATION AND HOUSING CENSUSES

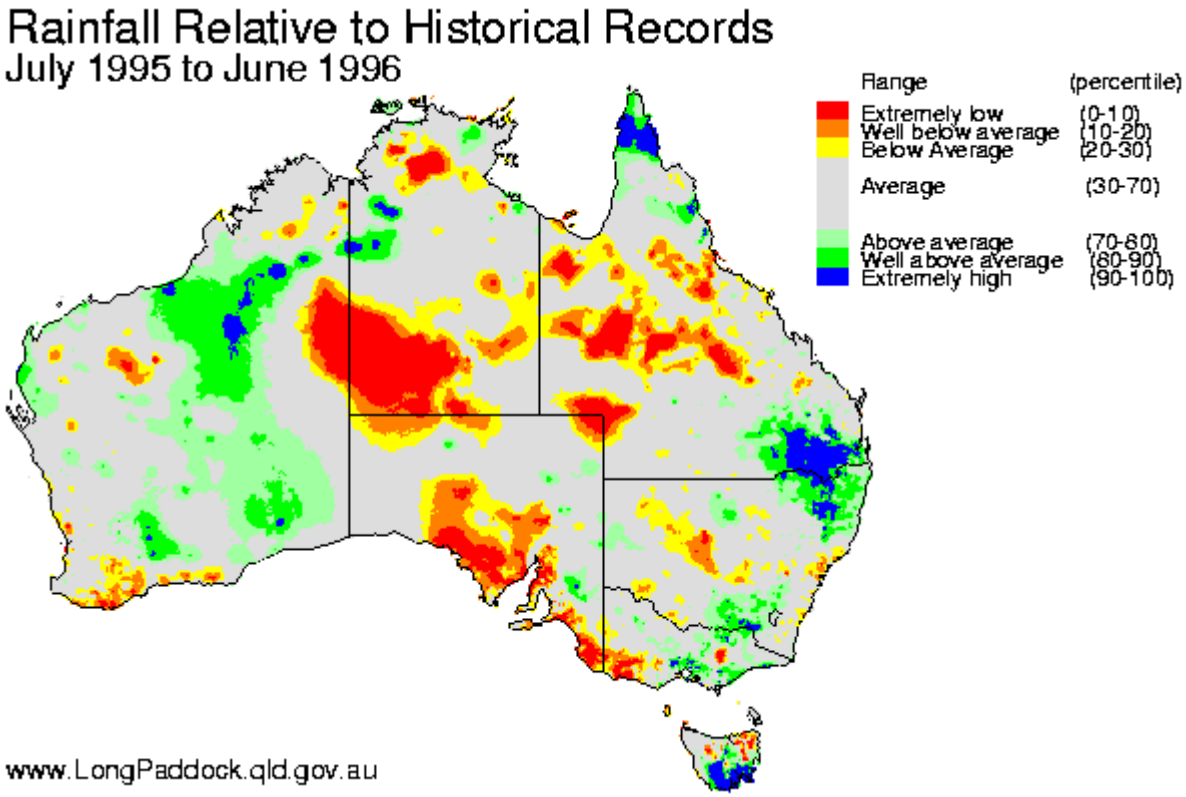


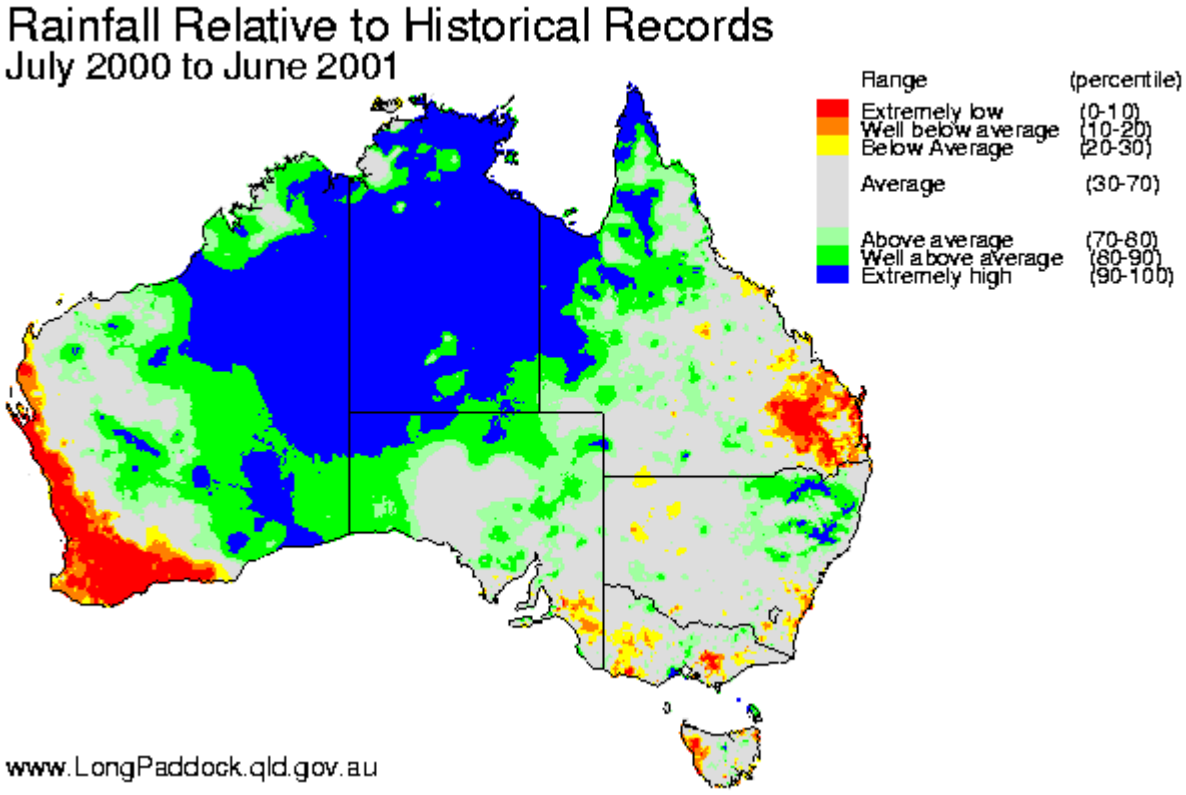
Source: ABARE.

2.3 ANNUAL RAINFALL DEFICITS FOR 1986, 1991, 1996 AND 2001









Source: Queensland Department of Natural Resources and Mines

CHAPTER 3 OCCUPATIONAL DECISIONS OF FARMERS 1976—2001

ENTERING FARMING

Aggregate rates of change in farmer numbers are an outcome of decisions to either enter or exit farming as an occupation. Entry to farming is one of the major adjustment actions which has an impact upon the demographic structure of Australian agriculture. Agricultural adjustment decisions are often deferred to the point of intergenerational transfer. The decision 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 and retirement from agriculture. Entry to agriculture is also seen as a source of significant new skills and capital to agriculture.

Measuring entry into farming

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. A rate of entry to agriculture was calculated as a ratio of the total number of farmer and farm managers in the SLA.

The indicator does not fully measure all who enter farming whilst remaining in same address. There are three methods of entry, which may be under counted.

- Transition from farming as a minor occupation to farming as a major occupation: Entry to farming through a decision to stop working in off-farm employment and increase reliance on existing farm income will not be detected by this indicator. These farmers are counted in the census as farmers who have not changed address of usual residence since the previous census. Significant numbers of farmers entering by this method will become anomalies in our measure of exits from farming.
- The estimate of farm entry calculated from these questions does not include new entrants to farming who have maintained their existing residence separate from the farm.
- Family apprenticeship: Entering farming through intergenerational transfer may not involve a change of address in the case of younger farmers. The most comprehensive recent studies of new entry to farming both concluded that there is limited entry to farming through inheritance (Garnaut & Lim-Applegate 1997; Stayner 1997b)[1]. In those cases where younger persons enter farming through intergenerational transfer, their initial entry after schooling will be detected through basic population

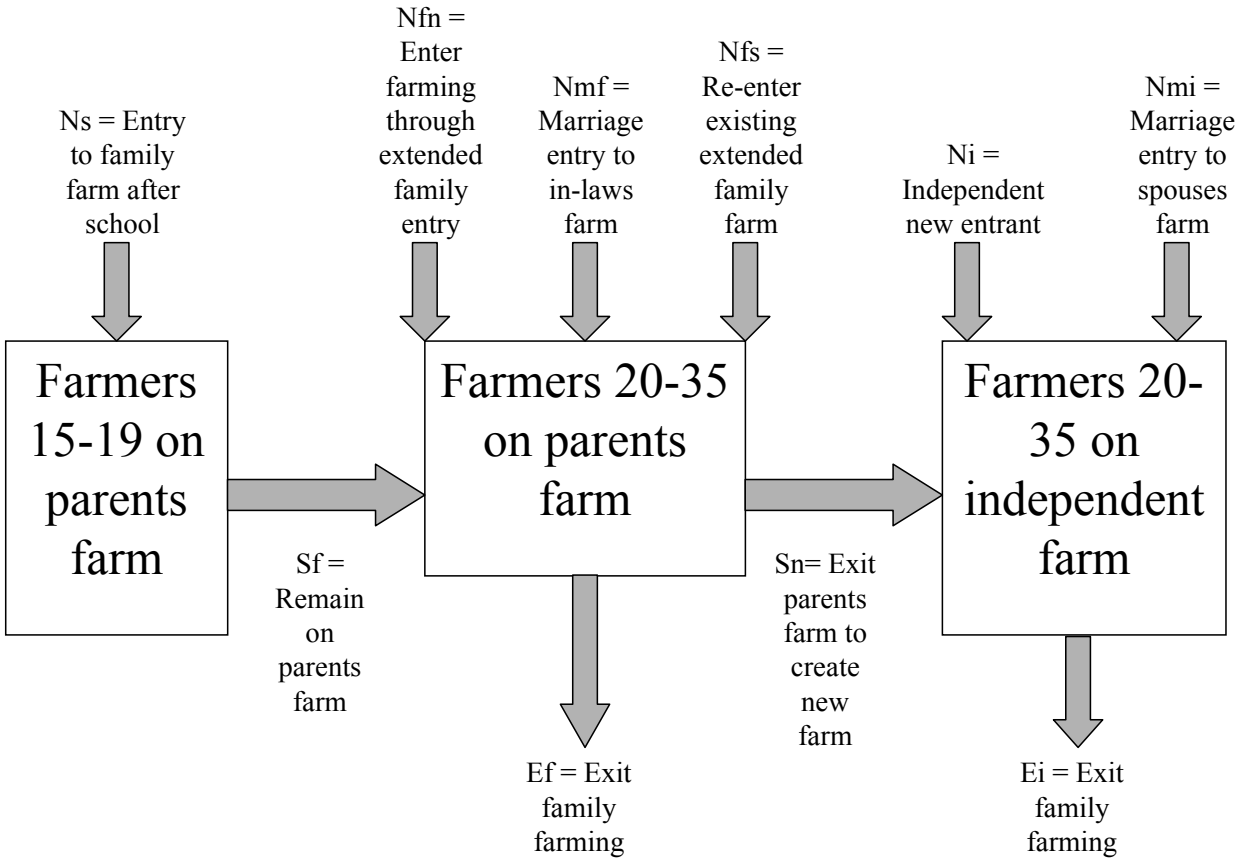
1 We again used the ABS indicator of household mobility to identify persons who entered farming by entering an existing farm household. This form of entry will generally be either return to farm from schooling or marriage. The extent of this form of entry was quite low.

counts of young farmers. Their entry will again be detected when they change address to establish their own household. This is discussed in greater detail in the next section.

Measuring the entry of young farmers

Entry to farming by younger persons is clearly more complicated than portrayed in the estimate we have described above. Some of this additional complexity is portrayed in figure 3.1. This provides a richer description of the interaction between entering farming as an occupation and the separate decision of leaving one's parents' household to establish a new household.

3.1 CONCEPTUAL MODEL OF FARM OCCUPATIONAL ADJUSTMENT AMONGST YOUNGER FARMERS



An attempt to estimate the size of each of these flows is shown in table 3.2. These estimates are based upon 2001 census data and are built around a cross-tabulation of two constructed variables. The Migration Pattern variable was created using the census variables UAI5P (Usual Address Five Years Ago Indicator) and MV5D (Household Five Year Mobility Indicator). The Household Type variable was created using the census variables FNOF (Family Number), FMTF (Family Type), FRLF (Relationship between Families) and HHTD (Household Type).

3.2 CREATING ESTIMATES OF ENTRY MODES FOR YOUNGER FARMERS

Household Type	*All houshold members migrated*	*Farmer migrated to household in which not all members migrated*	*Farmer in non-migrating household*	***Total***
Living in independent household	8,842 *(Ni, Sn)*	577 *(Nmi)*	9,073	**18,942**
Living with parents/in-laws household	739 *(Nfn)*	447 *(70 female) (Nfs, Nmf)*	5,200 *(Ns, 1,251) (Sf, 3,939)*	**6,386**
Household arrangements not defined	2,595	450	2,156	**5,201**
Total	**12,176**	**1,474**	**16,429**	

Note: Ni=Independent new entrant, Sn=Exit parents farm to establish new farm, Nfn=Enter through extended family entry, Nmi=Marriage entry to spouses farm, Nfs=Re-enter existing extended family farm, Nmf=Marriage entry to in-laws farm, Ns=Entry to family farm after schooling (age 15–19 years only), Sf=Remain on parent's family farm (age 20–34).

Two important observations should be noted from table 3.2. The first is that the majority of entrants to farming in the age group 15–19 years enter without changing their place of usual residence. Young persons joining family farms are describing themselves as farmers, even though they may essentially be performing a farm employee role. This again indicates the ambiguous nature of the self-definition of farmer. Our estimate of farm entries will generally detect these persons as 'entering' agriculture when they establish an independent household.

The second observation is that entries to farming through entry into an existing farming household comprise a small proportion of the total farm population. With the ongoing national trend for younger persons to delay the age of entry to the workforce in favour of a longer period of education, this component of entry is likely to have increased over the past two decades (Stayner 1997a). The increasing technical and management demands of farming imply this delay is important for increasing human capital in farming. In 2001, 1.7% of all farmers were counted in this group. Amongst farmers under 35 years this rose to 4.9%. Those entering existing farm households can be generalised into three distinct groups:

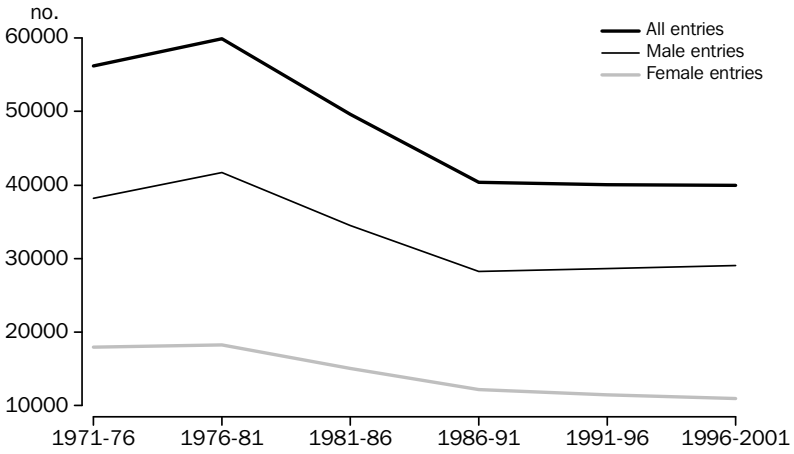
- 377 young men who appear to be rejoining their parents farming household
- 372 young women who are joining an established farming household, predominantly as the spouse or partner
- 205 young men who are joining an existing household through marriage or filial association.

Entries to farming unchanged since 1996

Entry to farming is a risky financial venture. New entrants have lower equity and are less buffered against fluctuating commodity prices and seasonal conditions.

Higher levels of debt make these new businesses much more likely to fail (Lindsay & Gleeson 1997). Despite these risks, there is a continuing interest in entering farming. Whilst the number of entries to farming declined significantly during the period 1976–1986, there has been little change in numbers entering through the following three intercensal periods. The number of farmers entering has been measured at approximately 40,000 in each of the last three censuses.

3.3 NUMBERS ENTERING FARMING AND RATE OF ENTRY TO FARMING — 1976–2001



Entry rate of younger persons stabilises

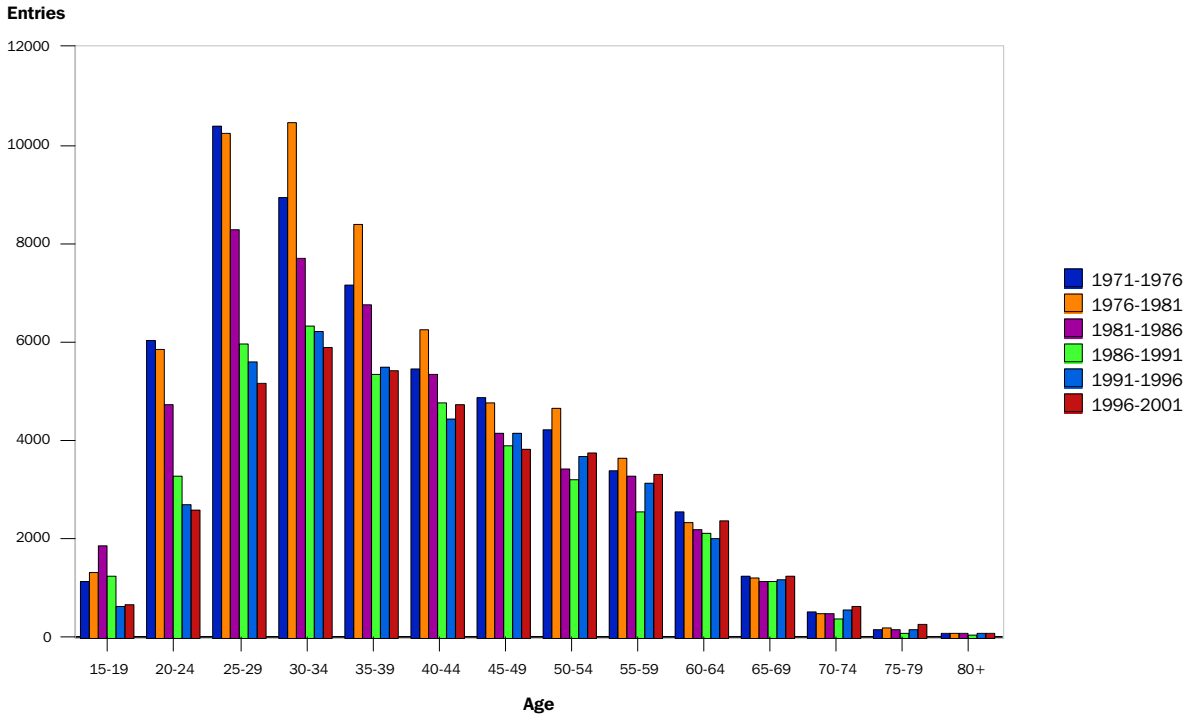
The number of younger persons entering farming declined significantly between 1981 and 1996 (graph 3.4). This decline slowed during the 1996–2001 intercensal period. The number of entrants under 25 years in 2001 was similar to the 1996 period (see also graph 4.8 for age group 15–19 years). The number of entrants aged between 25–35 years declined modestly. One interpretation is that we are seeing a stabilisation of younger entry at a new lower equilibrium. The age profile of new entrants to agriculture is now extremely different to that of a generation ago. In 1976 entry to farming had a pronounced peak in the 25–30 years age group. This peak has disappeared and the age distribution of new entrants now appears much flatter. Younger persons entering agriculture remain predominantly male (graph 3.4).

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 nonexistent (Curtis et al. 2000). This trend is 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 1997b). 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.

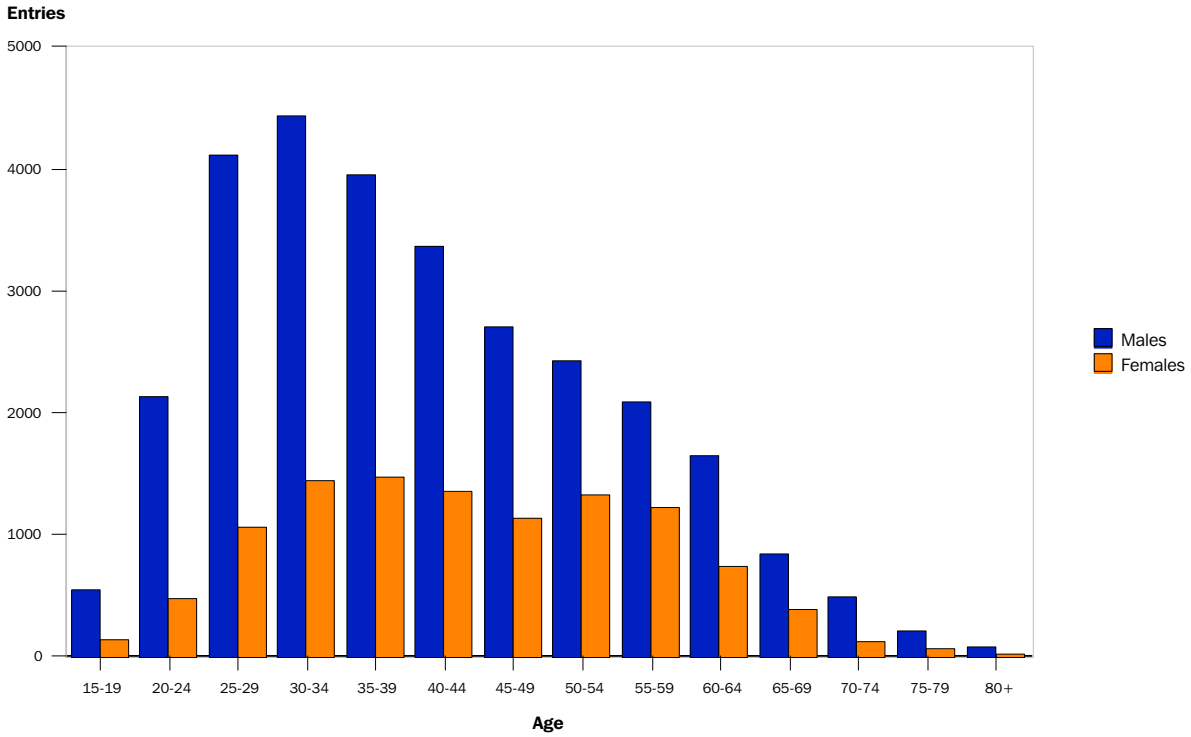
The decline in entry of youngest age group to agriculture is mirrored in workforce participation outside agriculture. During the late 1980s and early 1990s there was a general decline in the workforce participation of younger persons and an increased participation in education (Hugo 1998). Entry to the workforce was delayed until after a longer period of education. Modern entry to farming is more likely to occur in later years after education, significant workforce experience and the accumulation of capital (Stayner 1997b).

There has been little change in the number of older entrants to agriculture in the last two decades. Entry of older persons to farming has a limited impact on the age profile of the farming population. This impact is limited to proximity around significant regional centres (Benalla, Albury, Canberra, Orange and Tamworth) and in some of the coastal strip where amenity values are important. The impact of aged entry is also more apparent in the beef industry, and to a lesser, but growing extent, in the sheep industry (Barr, Karunaratne & Wilkinson 2003).

3.4 NUMBER OF NEW ENTRANTS TO FARMING BY AGE—1976–2001

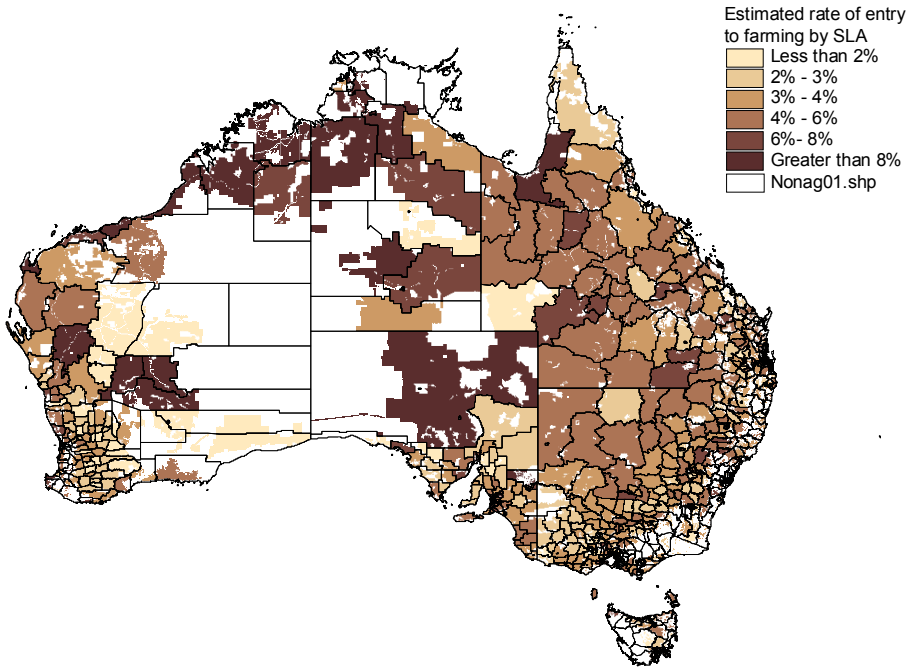


3.5 ENTRIES TO FARMING BY AGE AND SEX — 1996–2001

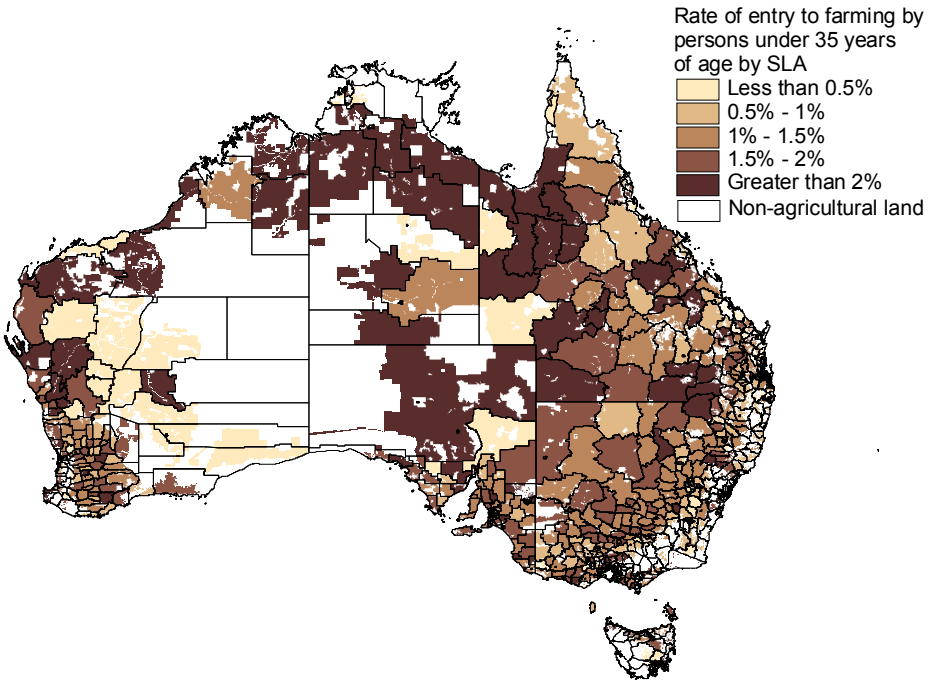


Source: 1996 and 2001 Census of Population and Housing.

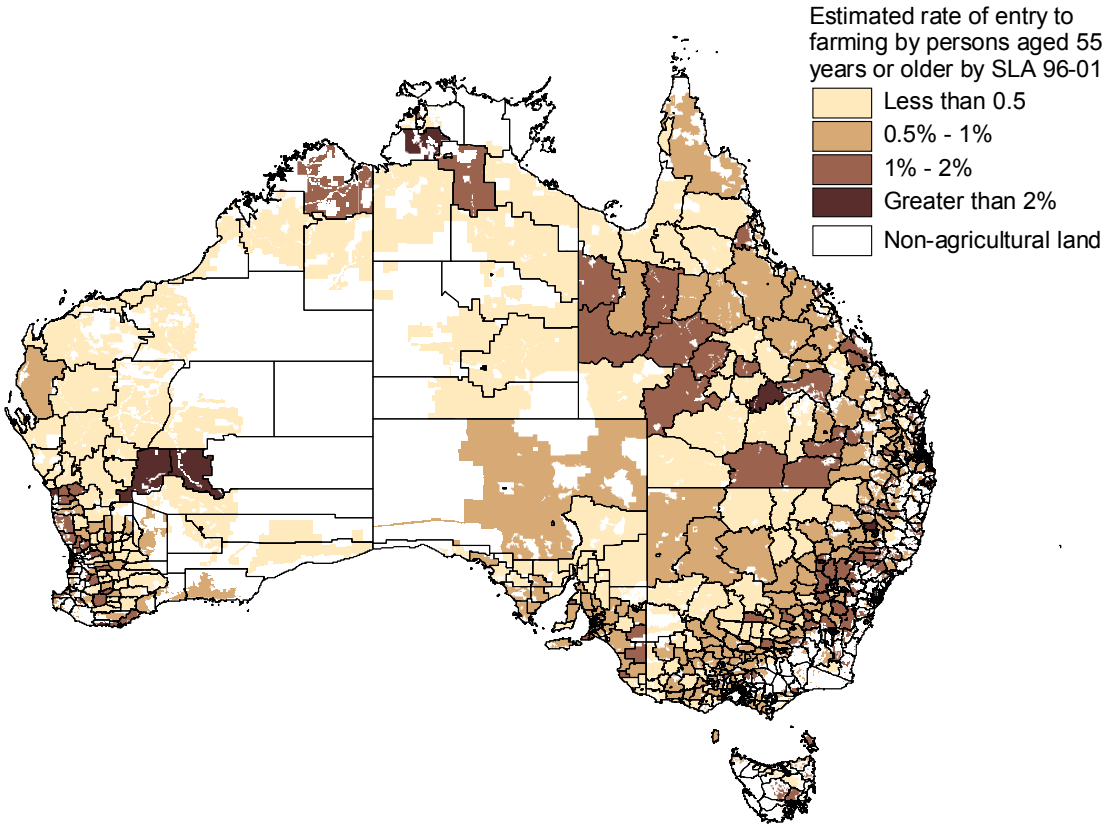
3.6 ESTIMATED NUMBER OF PERSONS ENTERING A CAREER AS FARMER OR FARM MANAGER AS A PERCENTAGE OF FARMERS AND FARM MANAGERS — 1996–2001 BY SLA



3.7 ESTIMATED NUMBER OF PERSONS YOUNGER THAN 35 YEARS ENTERING A CAREER AS FARMER OR FARM MANAGER AS A PERCENTAGE OF FARMERS AND FARM MANAGERS — 1996–2001 BY SLA



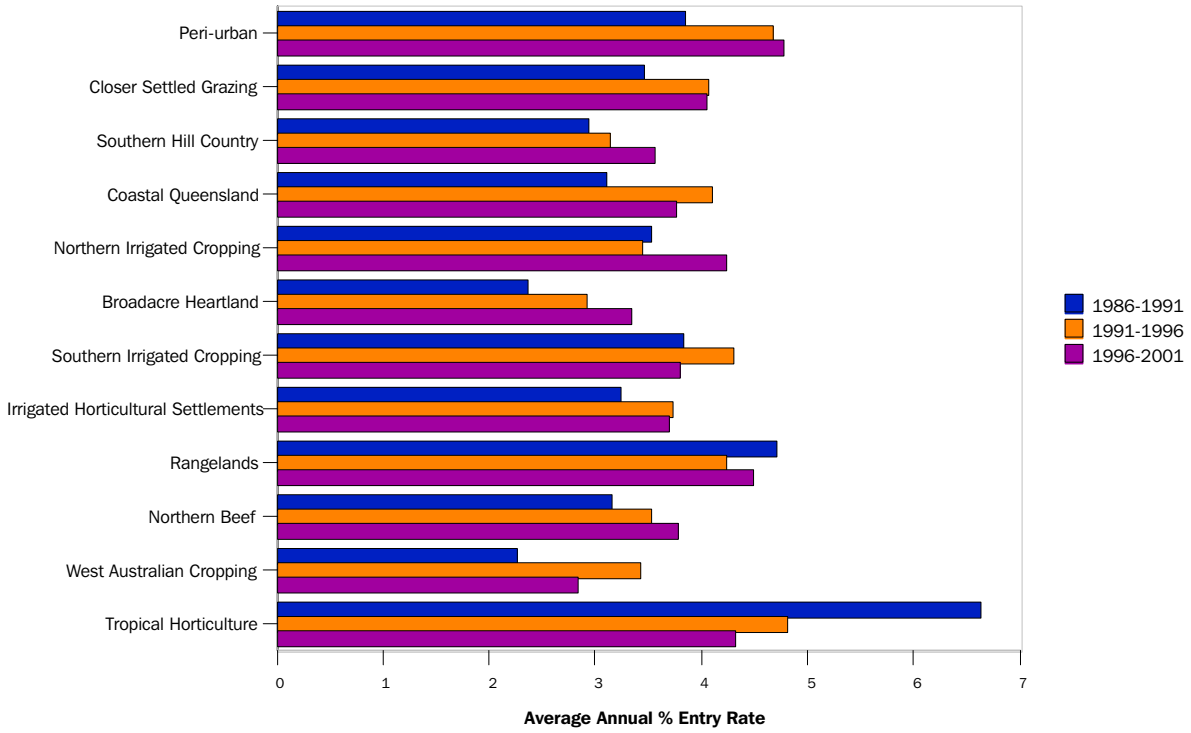
3.8 ESTIMATED NUMBER OF PERSONS OLDER THAN 55 YEARS ENTERING A CAREER AS FARMER OR FARM MANAGER AS A PERCENTAGE OF FARMERS AND FARM MANAGERS — 1996–2001 BY SLA



Regional differences in entry behaviour

There are not great differences in the entry rates to farming in most of the farming regions. The dryland cropping regions of southern Australia remain the regions with the lowest rates of entry to agriculture. This presumably reflects the limited number of small properties in this region that allow purchase by a new entrant with limited capital. Entry rates were highest in the Peri-urban area and the Rangelands, reflecting two quite different dynamics of adjustment. In the Rangelands the high rate of entry is a reflection of the significant number of employee managers in relatively short tenure in positions. In the Peri-urban region and the coastal strips near major population centres, entry is associated with urban rather than rural patterns of family migration.

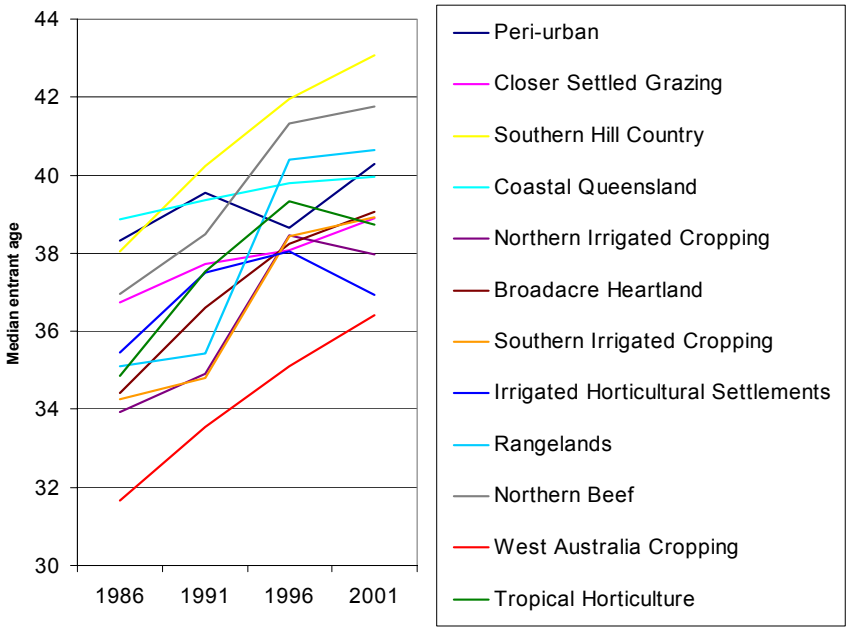
3.9 ESTIMATED AVERAGE ANNUAL ENTRY RATE TO AGRICULTURE BY CLUSTER REGION — 1986–2001



Three distinct patterns of the relationship between age and entry are obvious in graph 3.10.

- In higher amenity areas dominated by grazing activities, average entry ages are high and have risen significantly in the last 15 years. The median age of new entrants in the Southern Hill Country rose by five years from 38 years to 43 years between 1986 and 2001.
- In lower amenity cropping country, the median age of entry is low, but has also risen significantly in the last 15 years.
- In irrigation settlements dominated by dairying and horticulture, median entry ages have increased at a lower rate than other agricultural regions.

3.10 MEDIAN AGE OF ENTRY TO FARMING BY REGIONS — 1986–2001



EXITING FARMING

Australian farm policy has for many years construed the high percentage of economically small farms in Australian agriculture to be a limitation upon the competitiveness of Australian agriculture. The number of farms in Australian agriculture has declined by 1.3% per annum over the past few decades (Lindsay & Gleeson 1997). Encouraging persons operating economically small farms to exit from farming has often been seen as an important step towards improving the international competitiveness of Australian agriculture. The traditional expectation of adjustment in agricultural industries facing low incomes is that employment in the sector will fall as farmers change to other occupations. Jackson-Smith summarised this expectation thus:

> A focus on competition in the market place as a key mechanism for structural change has led to the common, but largely untested, belief that most change occurs via the involuntary exit of farmers who could not compete, and the (inevitable) adaptations of those who remain in business (Jackson-Smith 1999).

The encouragement of increased exit rates from agriculture has been an objective of successive rural adjustment policies through the provision of assistance such as household support, financial counselling, re-establishment assistance or even business planning assistance. However, these policies have had limited impact upon the structure of Australian agriculture (Australian Bureau of Agricultural Economics 1975; McColl, Donald & Shearer 1997).

This lack of impact has not been because the rate of exit from Australian agriculture is low. While the annual net rate of decline in farmer numbers has been a little over 1% per annum, the actual rate of exit of farmers from

agriculture can be much higher. In 1971 linked data records from the Canadian Farm Census and Population Census allowed detailed examination of the rates of entry and exit from agriculture. This revealed that behind a net decline in farmer numbers of around 1% per annum there was an entry rate to farming of 6% per annum and an exit rate of 7% (Steeves 1979). Data in the United States does not allow a repeat of the Canadian analysis, but limited studies there suggests the rates of entry and exit may have been even higher (Perkins & Hathaway 1964).

Measuring farming exits

Use of data from the CPH to calculate Australian farm exit rates is problematic. 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 have calculated a proxy measure of exit rates for most age groups using the formula:

$$EXITS_T = FARMERS_{T-5} - CONTINUING_T$$

where

$EXITS_T$ = Number of farmers exiting farming between year T-5 and year T.

$FARMERS_{T-5}$ = Number of persons describing themselves as farmers in year T-5.

$CONTINUING_T$ = Number of persons describing themselves as farmers who did not change their usual address between year T-5 and year T.

Some simple algebra will show that this method of calculating exits is equivalent to the method used in an earlier report in this series (Barr 2001a) and used to create estimates of exit from United States agriculture (Gale 2003).

$$EXITS_T = FARMERS_{T-5} - FARMERS_T + ENTRANTS_T$$

where

$FARMERS_T$ = Number of persons describing themselves as farmers in year T

$ENTRANTS_T$ = Number of persons describing themselves as farmers who changed their usual address between year T-5 and year T. These farmers are assumed to be new entrants to farming.

For the oldest age group, farmers aged 80 years and over, the exit rate is calculated using the following formula:

$$EXIT_{80T} = FARMERS_{75(T-5)} + FARMERS_{80(T-5)} - CONTINUING_{80T}$$

where

$EXIT_{80T}$ = Number of farmers exiting farming 1996 to 2001

$FARMERS_{75(T-5)}$ = Number of persons aged 75–79 years in year T-5 describing themselves as farmers in year T-5

$FARMERS_{80(T-5)}$ = Number of persons aged 80 years or more in year T-5 describing themselves as farmers in year T-5

$CONTINUING_{80T}$ = Number of persons aged 80 years or more in year T describing themselves as farmers who did not change their usual address between year T-5 and year T.

These estimates rest on the assumption that entries to farming are associated with a change of usual address. Clearly, not all occupational entries or exits are associated with an address change. Our estimate of farming exits will count as an exit, a farmer who takes an off-farm job while continuing to work the farm, and change his or her occupational self-description on the census form to something other than a farmer. However, when this same farmer ceases his off-farm job and reverts to farming as his main occupation, he or she will not be detected in our count of entries to farming. Instead, his change in occupation will be counted as a negative exit in our exit estimate. This is most obvious in the counts of exits for farmers aged 20–24 years. Exit counts for this age group are generally negative. The number of exits in this age group is less than the number of persons entering farming after previously being classified as a student.

Because of these shortcomings, estimates of exit rates from this measure must be treated with caution. The measure should be seen as a measure of both exits associated with an address change and net change in occupational status of persons who live on a farm and have not changed address in the previous intercensal period.

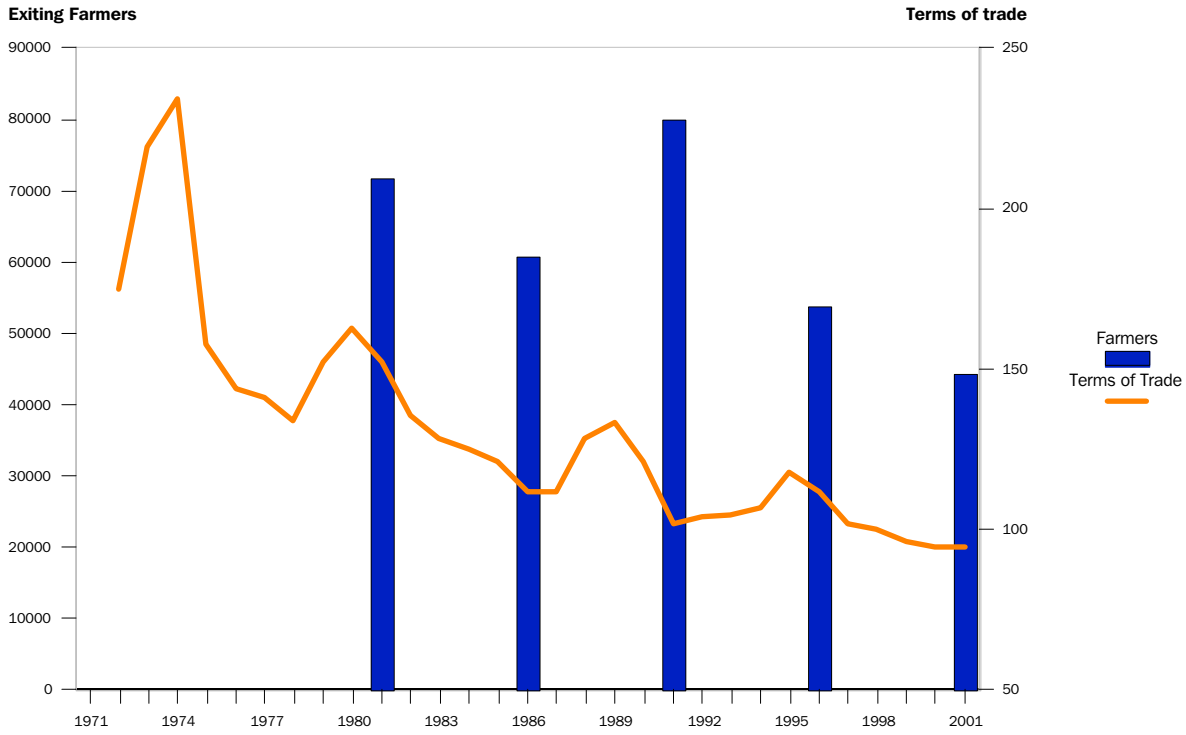
Gradual decline in rates of exit from farming

With the addition of data from the 2001 census as well as from the 1981 and 1976 censuses, it becomes apparent that the number of exits from farming during the 1986–1991 intercensal period was unusually high (graph 3.11). It is important to note that the two highest exit counts were after a temporary peak in commodity prices. This is counter to the intuitive assumption that poorer commodity prices will lead to a higher rate of exit from agriculture. Previous research has shown that exits from Australian broadacre agriculture are higher during periods of strong land prices and fall during periods of low commodity prices when land markets are weak (Australian Bureau of Agricultural Economics 1975; Core 1973; Core 1974; Paul 1976).

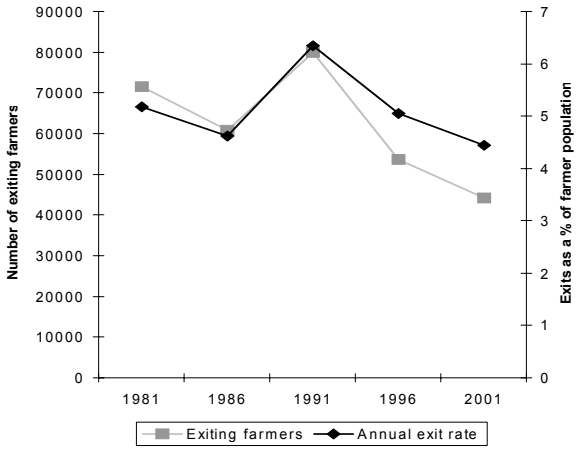
This counter-cyclical interpretation is not the only explanation of high exit numbers in the 1986–1991 intercensal period. A large number of wool producers took off-farm work after the collapse of the wool price in 1990, removing themselves from the census count of farmers, but not leaving their farms.

Since the peak of 6%, exit rates have fallen over the two most recent intercensal periods to a new low of 4.4%. This decline appears to be a return to historic rates of entry. It is also in part caused by the return to full-time farming by wool producers who took on off-farm jobs after the wool price fall in 1990 and who are now relinquishing those jobs to farm full time in their mid-50s (Barr, Karunaratne & Wilkinson 2003). Female exit rates have fallen much faster than male exit rates (graph 3.13).

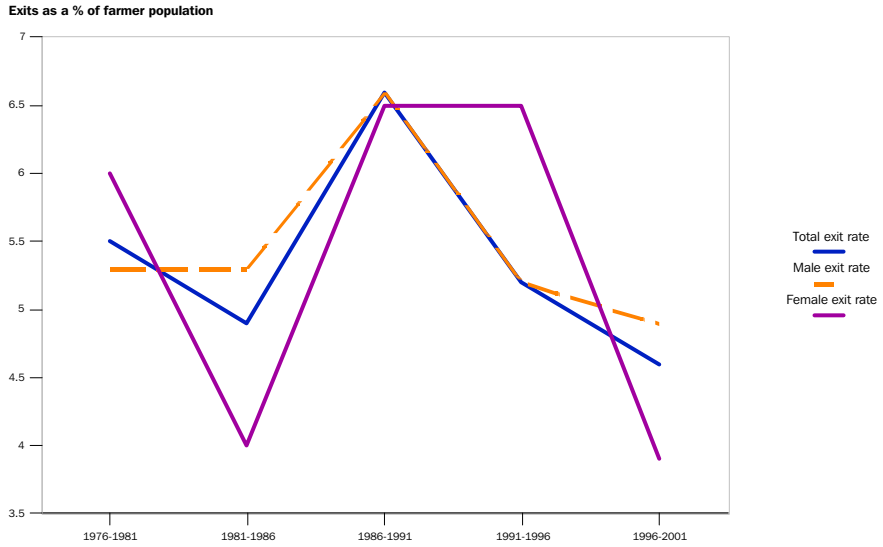
3.11 NUMBER OF FARMER EXITS FROM AGRICULTURE AND AGRICULTURAL TERMS OF TRADE — 1981–2001



3.12 NUMBER OF FARMER EXITS AND FARMER EXIT RATE — 1981–2001



3.13 FARMER EXIT RATE BY SEX — 1981–2001



Younger and older farmers are more likely to leave

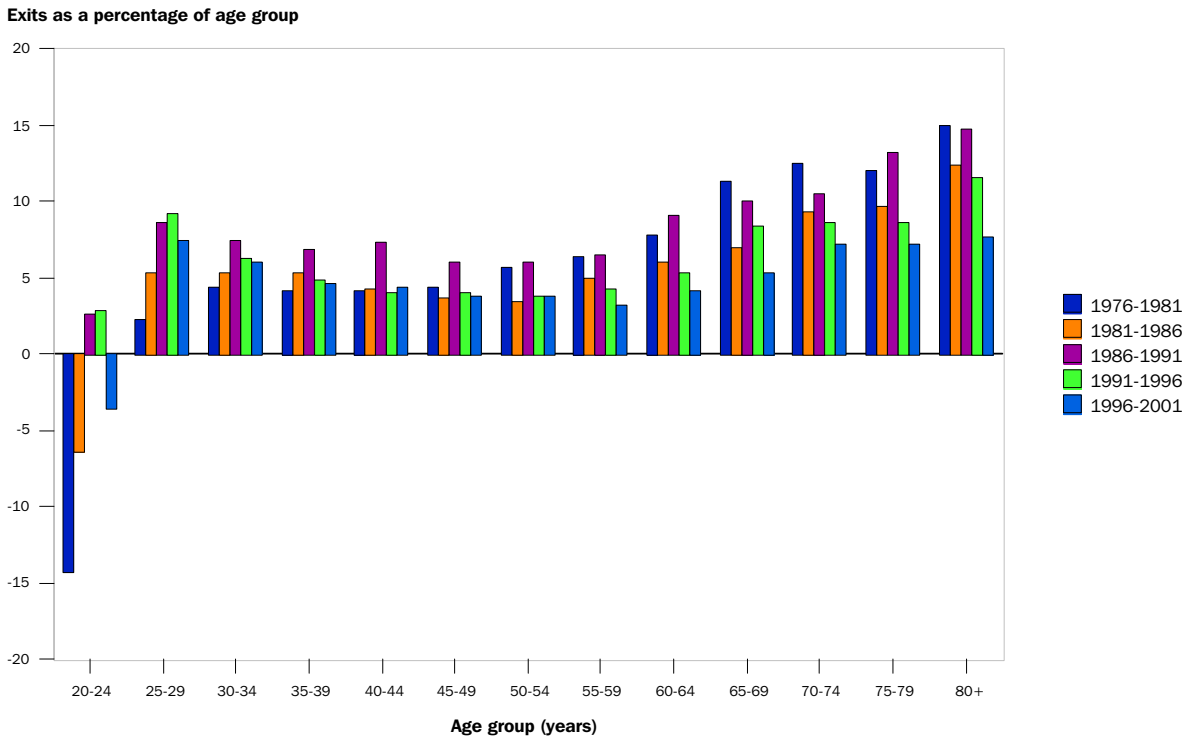
Graph 3.14 reveals a consistent relationship between age and exit behaviour across the five intercensal periods portrayed. Exit rates decline from 25–35 years of age, remain at a minima for the ages 35–55 years, and then increase with increasing age. The trends in exit rates differ across these three age groups:

- Young exit rates have stabilised at high level: Younger farmers are at an early stage of their working life and have a greater number of working years in which to capture the benefits of a career change (Topel & Ward 1992). They are also likely to be increasingly well educated, providing more attractive non-farming employment options than a generation ago. They are less likely to have dependents, enabling them to be both more mobile and to take greater risks. They are also unlikely to have a significant investment in farm equity. The decision to leave the industry will be less influenced by concerns about maximising the value of the farm sale price during a period of low commodity prices. Exit rates amongst the youngest age groups rose considerably during the 1980s. In the case of the 25–29 year age group, this increase was from a little over 2% per annum to over 6% per annum. The exit rate has stabilised around this level during the 1990s.
- Little change in mid-career exits: Many in the mid-career group will have significant farm equity. Leaving farming will be less attractive to this group as they will need to establish an alternative occupation, but will have fewer years to capture the benefits of this change. Future financial security will be more dependent upon the price they receive for the sale of their farm. In a period of low commodity prices, this group will often adopt a strategy of delaying any farm sale until there is a recovery in the land market (Core 1973). The exit rates of mid-career farmers show no linear trend over

time. During or immediately after periods of higher commodity prices the exit rate for this group generally rises, falling back to a consistent rate of approximately 4% in 'normal' intercensal periods.

- Exit rates of older farmers declining: The older farmer group will generally not be influenced by the labour market as exiting will be part of a retirement strategy, whether formal or informal. They will have significant farm equity. They will have the same concerns as the mid-career group about maximising the price from any farm sale. Maximising returns from farm sale will be motivated by the need to secure funding for retirement. However, the decision to exit farming will also be increasingly influenced by health considerations with increasing age. The result is an increasing exit rate with age and a reduced exit rate during periods of low commodity prices. The rate of exit of older farmers appears to be decreasing as part of a longer-term trend. Exit rates of farmers aged 55 years and over were stable during the 1980s. During the 1990s the rate of exit of farmers aged over 55 years has been falling. For farmers aged 55–59 years, the rate of exit has almost halved.

3.14 RATE OF EXIT FROM FARMING BY AGE — 1976–2001



Source: 1976–2001 Censuses of Population and Housing

Limited regional variation in exit rates

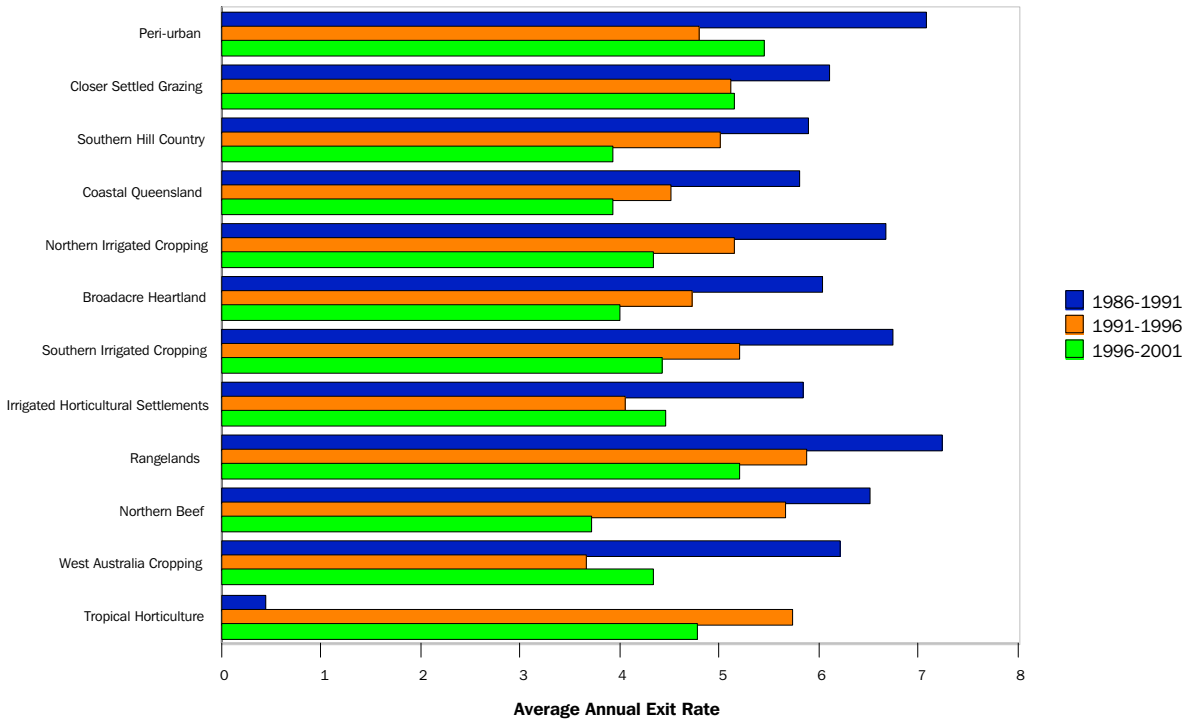
Regional variation in exit rates was quite limited in the most recent intercensal period. Three regions had clearly higher exit rates: the Peri-urban, the Closer Settled Grazing and the Rangelands.

High exit rates in the Rangelands are not a reflection of property ownership changeover, but of the relatively short tenure of Rangelands employee managers on larger stations and stations owned by mining companies. Central Australia is a notable exception. The short-term nature of occupational farming status in the Rangelands is underlined by the high number of Rangeland farmers who indicate their usual residence is somewhere other than their location on census night.

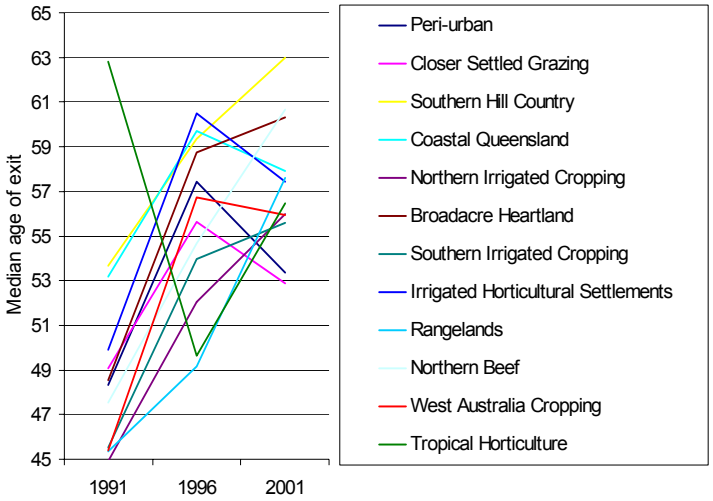
High exit rates in the Peri-urban area are probably part of the general pattern of urban migration and its high mobility rates. Higher than average exit rates are also observed in irrigation districts, particularly where dairying is a major industry such the Goulburn Valley of Victoria.

Again, there has been a consistent rise in the median age of exit across most regions. Median exit ages are highest in the broadacre grazing regions and the eastern cropping zone. Median exit ages are youngest in Peri-urban and Closer Settled Grazing zones, reflecting different reasons for exit.

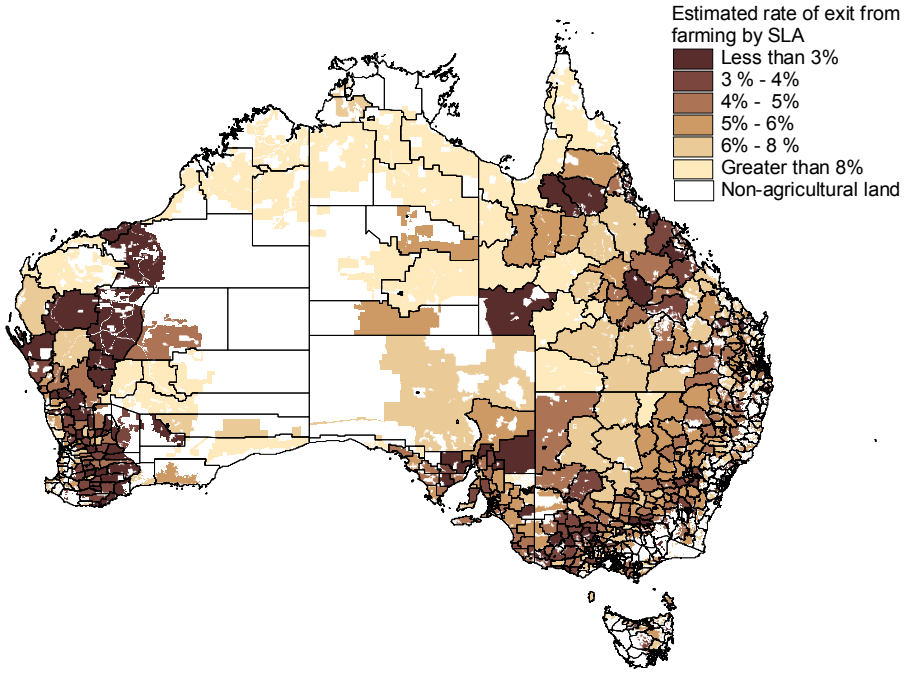
3.15 ESTIMATED PERCENTAGE RATE OF NET EXIT FROM FARMING BY REGION — 1986–2001



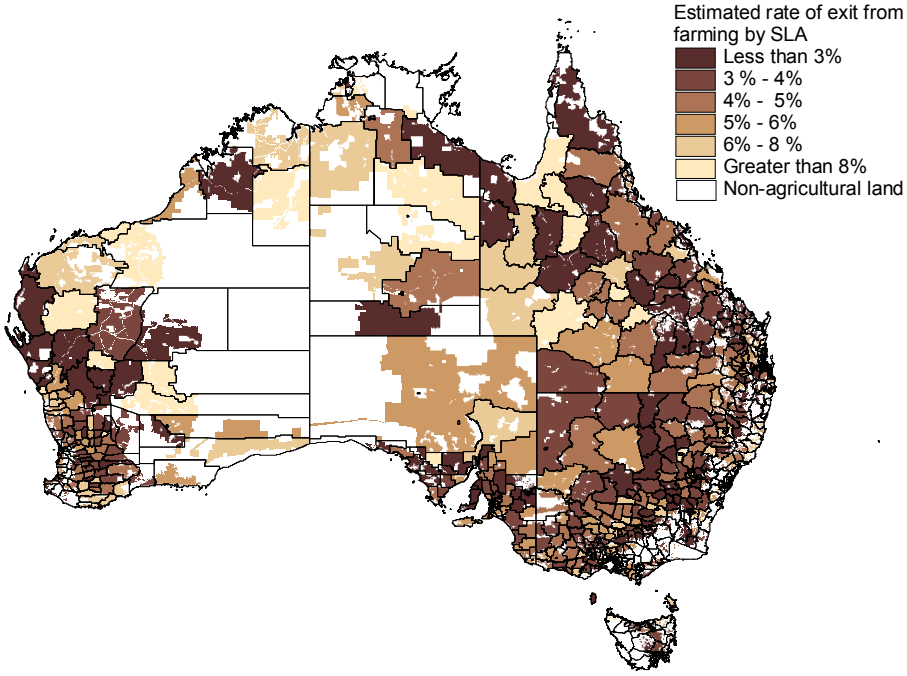
3.16 MEDIAN AGE OF EXIT FROM AGRICULTURE BY REGION — 1991–2001



3.17 ESTIMATED NET EXITS FROM FARMING AS A PERCENTAGE OF TOTAL FARMER POPULATION — 1991–1996 BY SLA



3.18 ESTIMATED NET EXITS FROM FARMING AS A PERCENTAGE OF TOTAL FARMER POPULATION — 1996–2001 BY SLA



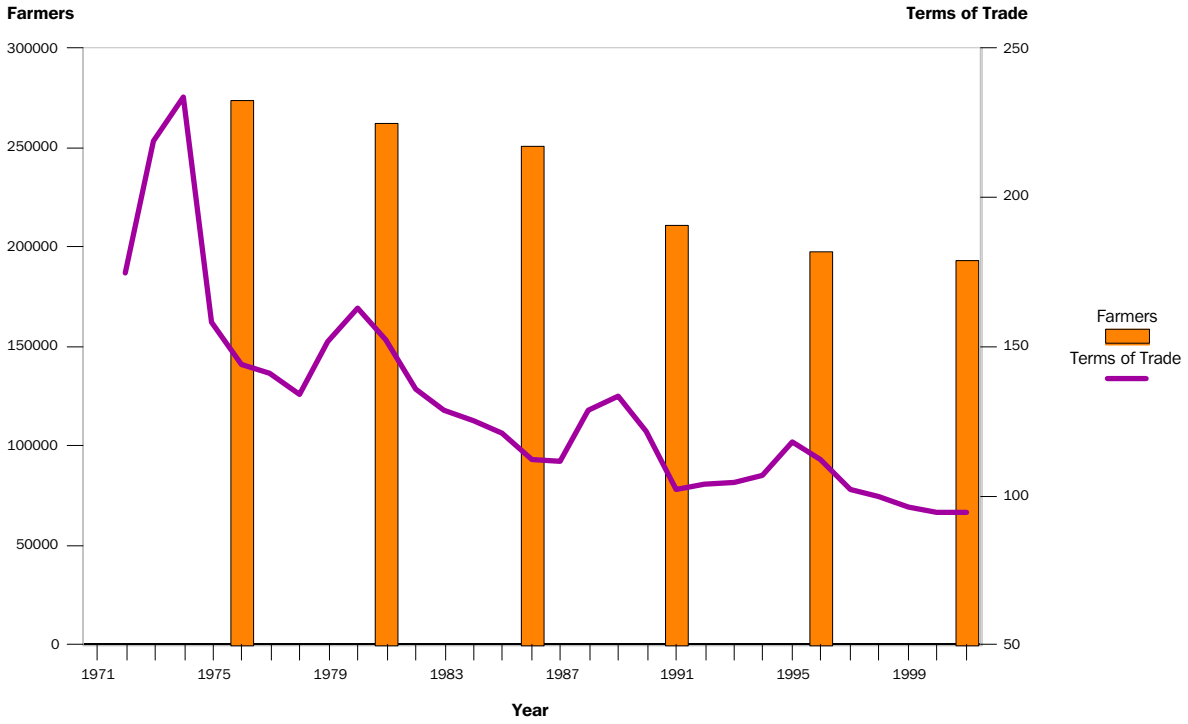
CHAPTER 4 CHANGES IN THE STRUCTURE OF THE FARM POPULATION

CHANGES IN THE FARMER POPULATION

Slowing decline in farmer numbers

Aggregate rates of change in farmer numbers are an outcome of decisions to enter or exit farming as an occupation. With no change in entry rates between the 1996 and 2001 censuses and a decline in exit rates, the result was a slowing in the annual rate of decline in farmer numbers to 0.44% per annum. In 2001 there was a total of 193,883 farmers reported in the CPH count. This is the slowest decline in farmer numbers of any of the six intercensal periods since 1976 and is one-seventh of the rate of decline of during the period between the 1986 and 1991 censuses. A major contextual difference between these two periods can be seen in the agricultural terms of trade portrayed in graph 4.1. The 1986–1991 intercensal period included a temporary increase in the terms of trade. The most recent intercensal period saw a continued gradual decline.

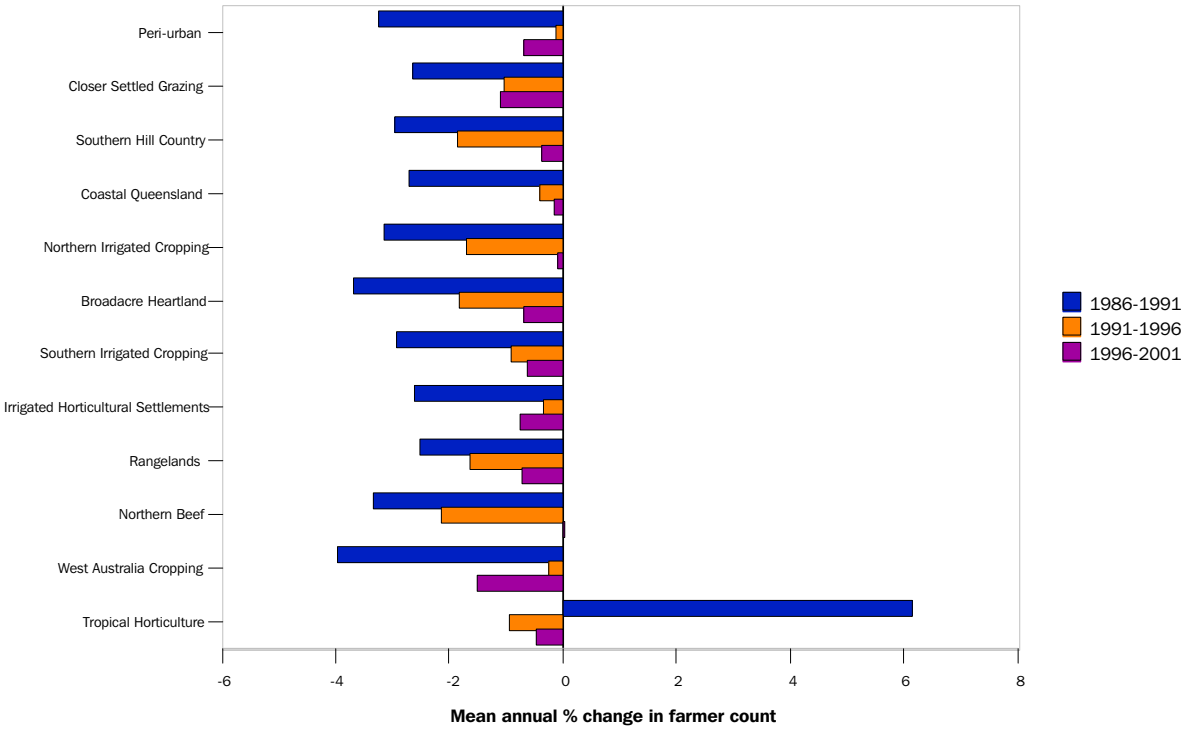
4.1 NUMBER OF FARMERS REPORTED IN THE CENSUS OF POPULATION AND HOUSING AND AGRICULTURAL TERMS OF TRADE — 1976–2001



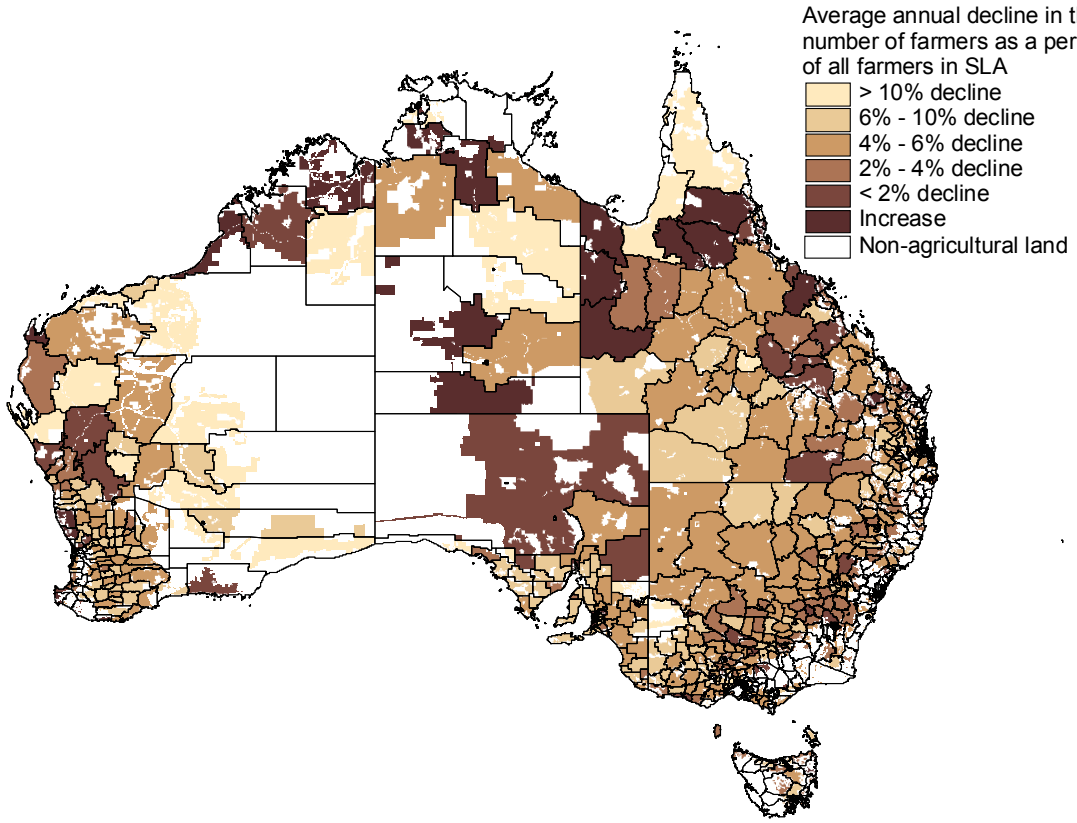
Decline greatest in cropping and dairy regions

The modest decline in farmer numbers is not the result of a uniform trend across rural Australia. Declines have been greatest in the West Australian Cropping region and the Closer Settled Grazing regions. The decline in these two areas is a result of the ongoing process of property aggregation as agriculture adjusts to declining terms of trade. This adjustment is more likely to occur where agricultural businesses are large enough to capture productivity increases and where competition for land from non-agricultural purchasers is limited. The cropping zone and dairy settlements have these characteristics.

4.2 MEAN ANNUAL PERCENTAGE CHANGE IN NUMBER OF FARMERS BY CLUSTER REGION — 1986–1996



4.3 AVERAGE ANNUAL PERCENTAGE DECLINE IN NUMBER OF PERSONS DESCRIBING FARMING AS THEIR MAIN OCCUPATION BETWEEN 1986 AND 2001 BY SLA



SPATIAL PATTERNS OF FARM MIGRATION

A map of changes in the aggregate number of farmers in a region encapsulates only the net impacts of entry and exit to farming. This does not indicate whether a stable count of farmers in a region is an outcome of low rates of both entry and exit, or is an outcome of high but equal rates of entry and exit. These differences are important for building the demographic model described later in this report.

A simple conceptual model of the relationship between entry and exit rates is shown in table 4.4. Below average exit and entry rates characterise areas which have traditionally been described as 'tightly held', and have been the focus of past rural adjustment policies. Relatively high entry and exit rates describe an area where property turnover could be described as a form of 'churning'. High exit rates and low entry rates are characteristic of a district where business amalgamation is consolidating faster than the national average. Low exit rates and high entry rates are characteristic of business fragmentation where farm numbers may be increasing and farms becoming smaller, or at least consolidating slower than elsewhere.

4.4 A SIMPLE CONCEPTUAL MODEL OF THE RELATIONSHIP BETWEEN FARM EXIT AND ENTRY RATES

		Exit Rate
Entry Rate	**Low**	**High**
Low	Tightly held	Consolidation
High	Fragmentation	Churning

The four-class model of adjustment depicted above was operationalised by classifying SLAs exit rates and entry rates into quartiles. These were then used to classify SLAs according to the classification rules shown in table 4.5.

It must be emphasised that the descriptions of SLAs in this model are relative. The classification of a SLA as 'fragmenting' does not necessarily imply that it has had an increase in the number of farm businesses, but that it has a relatively high entry rate and a relatively low exit rate. The results of this classification are shown for the period 1996–2001 and 1991–1996 (maps 4.6 and 4.7).

4.5 CLASSIFICATION MODEL OF ADJUSTMENT IN AUSTRALIAN SLAs

		Exit Rate		
Entry Rate	Lowest quartile	Second quartile	Third quartile	Highest quartile
Lowest quartile	Tightly held	Tightly held	Consolidation	Consolidation
Second quartile	Tightly held	Average	Average	Consolidation
Third quartile	Fragmentation	Average	Average	Churning
Highest quartile	Fragmentation	Fragmentation	Churning	Churning

TIGHTLY HELD REGIONS

Tightly held areas are found generally in the cropping zone of both east and west Australia. Relatively few persons enter farming in this zone, and relatively few leave. However, the rate of exit is sufficiently greater than the rate of entry to ensure there is considerable ongoing consolidation of properties. Cropping requires high skill levels and high capital for machinery and crop establishment. It is not likely to attract new cropping farmers. Entry is likely to be a sign of farm family members returning to the farm after a period earning income elsewhere.

CHURNING REGIONS

High rates of entry and exit are a characteristic of the rangelands of northern and Western Australia. One explanation is the significant number of establishments managed by salaried employees. A significant minority of farmers in this region nominate another part of Australia as their place of usual residence.

In the 1980s churning was a general characteristic of irrigation regions. However, this feature has become much less apparent in the most recent intercensal period. High commodity prices for the dairy and wine grape industries may have reduced the opportunities for new entrants to these areas.

FRAGMENTATION

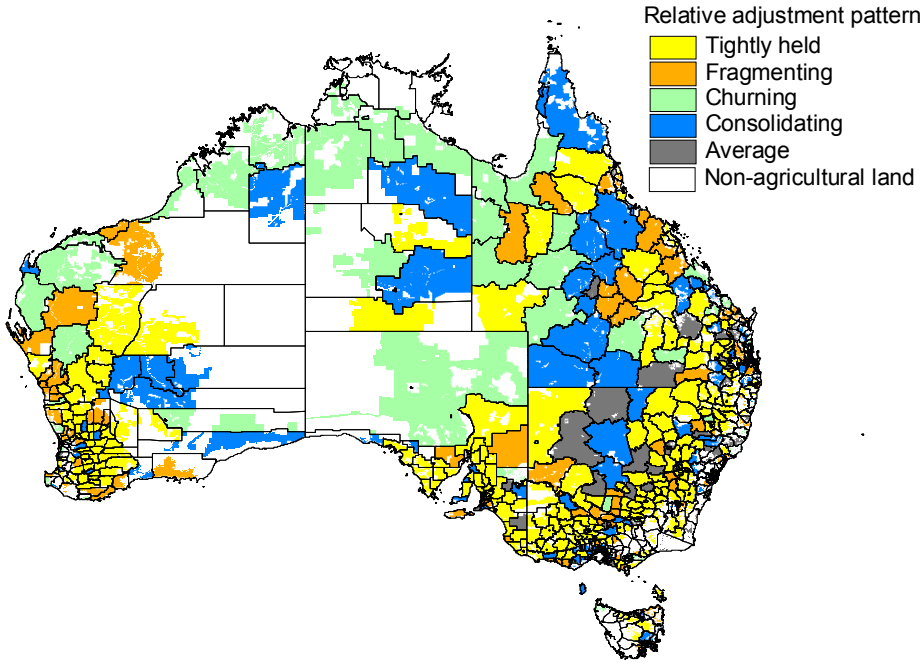
During the most recent intercensal period fragmentation was observed in two starkly different regions. High entry and low exit rates were apparent in peri-urban districts across the country. These included the coastal areas north and south of Perth, the SLAs surrounding Adelaide and Melbourne, coastal areas to the north of Brisbane and SLAs surrounding some major regional centres. Here relatively low exit rates and high entry rates reflect the allure of farm holdings in these regions as a lifestyle choice. The large number of small farm holdings allows easier entry, and the competition for land from new entrants reduces the potential for farm consolidation.

Fragmentation patterns were also observed in the arid rangelands of Western Australia and South Australia. High entry rates and low exit rates from these regions are harder to explain. There may be many contributing factors, including purchase of some stations by mining companies or by the Indigenous Lands Corporation. What is clear from other research is that despite its remoteness, the Rangelands of Australia are being transformed in much the same way as the rest of rural Australia by the combined forces of commodity prices, amenity and cultural change (Holmes 2002).

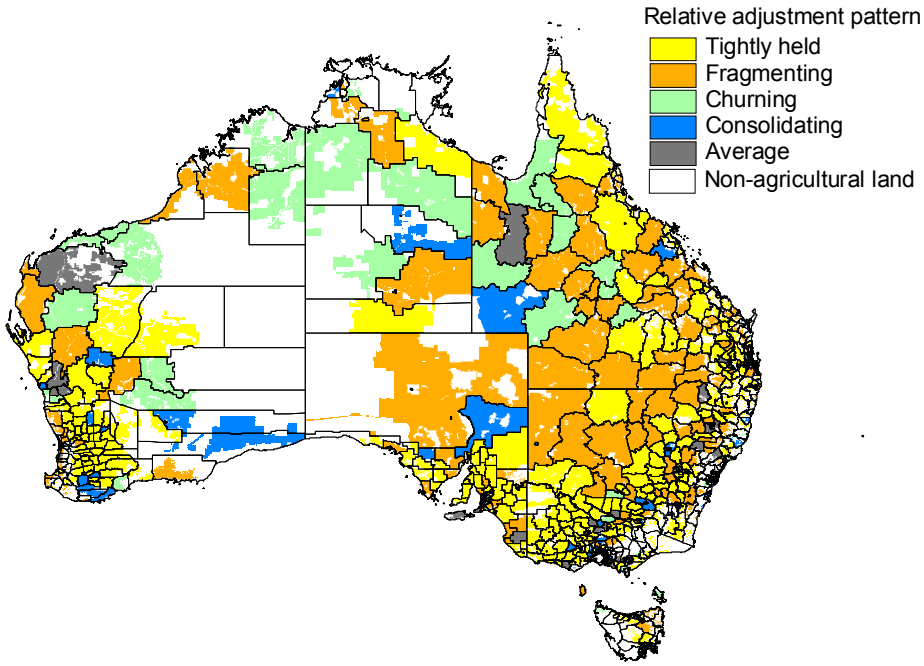
CONSOLIDATION

Relative consolidation, high exit rates and low entry rates, is comparatively uncommon as well as temporally unstable. The areas of consolidation in 1996–2001 differ from those observed in the previous intercensal period.

4.6 RELATIVE ADJUSTMENT PATTERNS BASED UPON ENTRY AND EXIT MEASURES BY SLA — 1991–1996



4.7 RELATIVE ADJUSTMENT PATTERNS BASED UPON ENTRY AND EXIT MEASURES BY SLA — 1996–2001



AGEING OF THE FARMER POPULATION

The decline in the rate of entry of younger people to farming and the associated deferral of retirement from farming can be expected to lead to an ageing of the farm population. The ageing of the farm population has been evident in official statistics in Australia since 1981 (Ferguson & Simpson 1995; Garnaut & Helali 1999). The ageing of the farm workforce is also apparent in other developed countries (Anon 2000; Freshwater 2000; Reimer & Apedaile 2000). There is debate at the significance of this ageing. One point of view is that ageing is an artefact of statistical measurement and that what little ageing has occurred has no implications for the health of the agricultural sector (Archer & Catt 1998). As will be seen from the data presented in this section, there is some validity in this claim when viewed from an industry perspective. Ageing is greatest in areas where farm aggregation has slowed and small farms predominate. These areas are less and less important for aggregate agricultural production figures. The largest 10% of farms produce 50% of the value of Australia's agricultural production. The smallest 50% produce only 10% of the value of agricultural production. However, ageing is potentially a significant issue for the wool and beef industries.

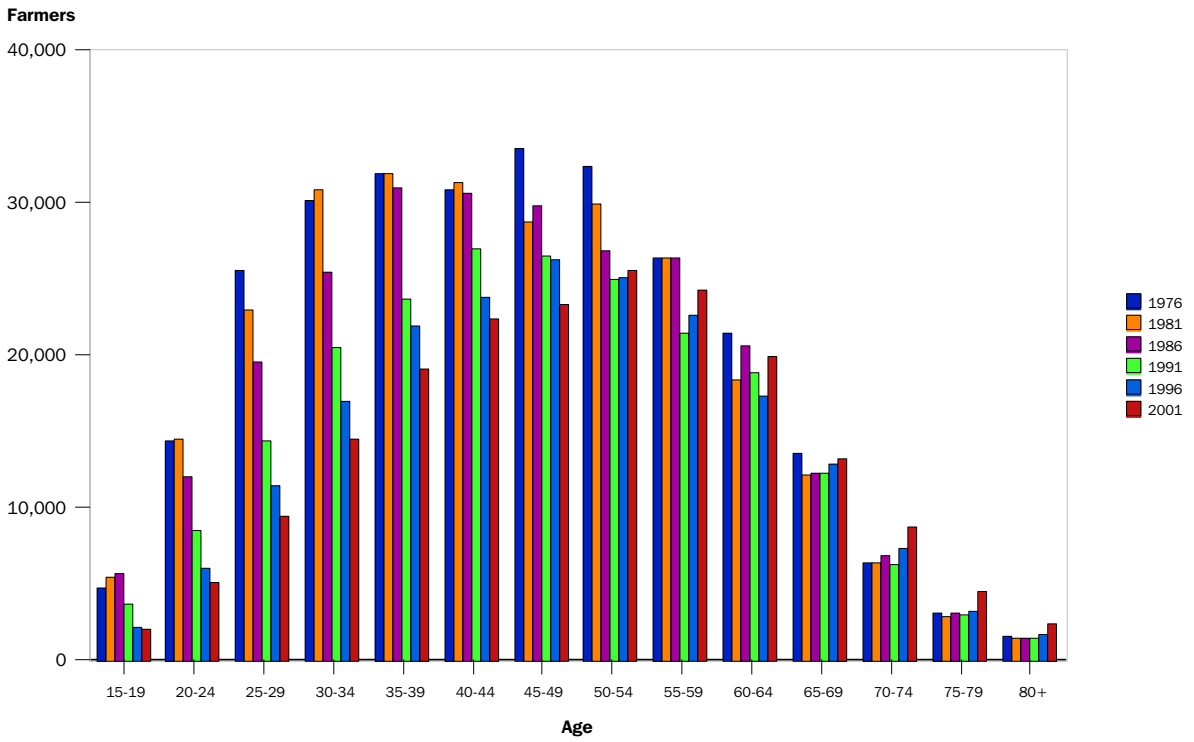
While some parts of the landscape may be less and less important for agricultural production, the management of these landscapes may remain an important policy issue in the domain of natural resource management. The phenomena of ageing may be the beginnings of an evolution to a new social landscape in which agricultural production is of far less importance. This ageing also has implications for the provisions of human services in rural areas (Rogers 1999).

Fewer younger farmers, more older farmers

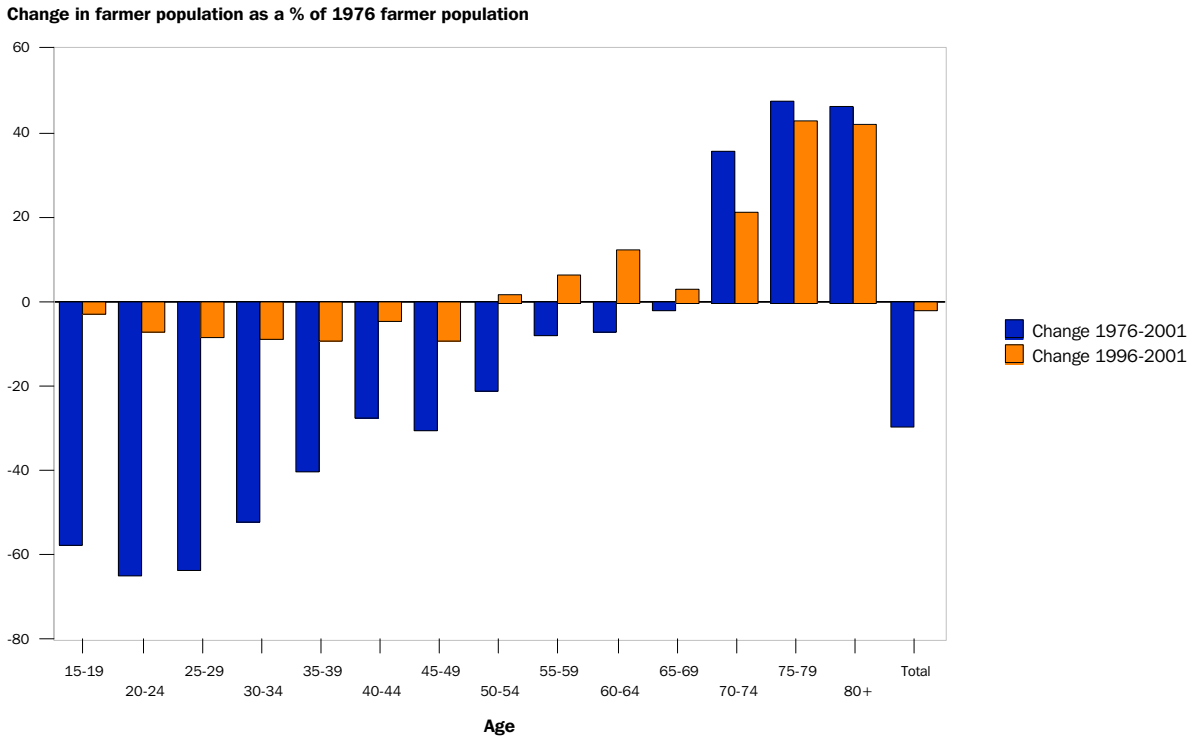
Whilst the number of farmers has declined only marginally, differential changes in the entry and exit rates of younger and older farmers mean that the age profile of the farming population is changing, despite the limited change in the total number of farmers.

Between 1971 and 2001, farmer numbers have declined in all age groups younger than 50 years of age. This decline is most marked in age groups younger than 35 years, in which population counts have declined by at least half over this period. There has been a more modest increase in the numbers of farmers in age groups older than 55 years. Much of this increase has occurred in the past decade, largely as a result of the recent trend towards decreasing exit rates identified in the previous section.

4.8 NUMBER OF PERSONS WITH FARMING AS THEIR MAIN OCCUPATION BY AGE GROUP — 1976–2001



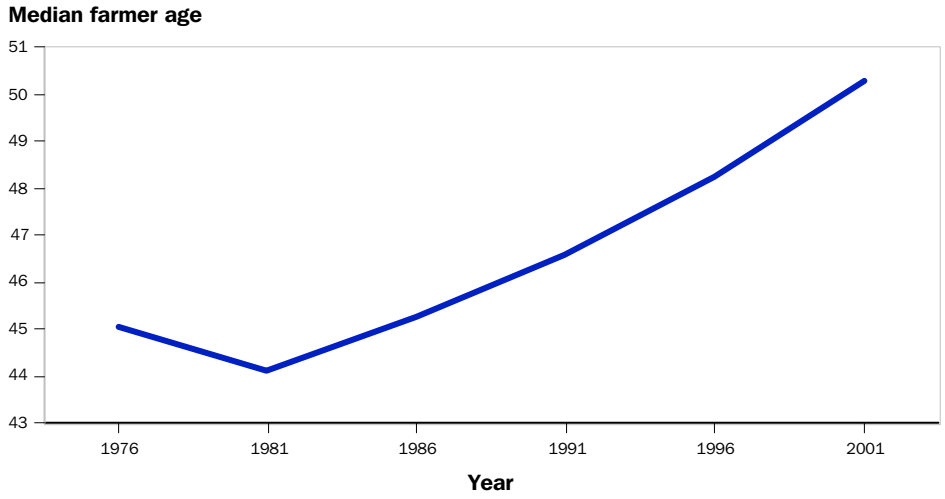
4.9 DECLINE IN NUMBER OF PERSONS DESCRIBING FARMING AS THEIR MAIN OCCUPATION BETWEEN 1976–2001 AND 1996–2001 BY AGE GROUP AS A PERCENTAGE OF PERSONS IN EACH AGE GROUP IN 1976



Increasing median farmer age

The result of this differential decline in the number of Australian farmers by age is an inevitable increase in the age of Australian farmers. We calculated the median age of Australian farmers using assumptions of uniform age distribution across 5-year age classifications. The results for each census year between 1976 and 2001 are shown in graph 4.10. Within this period, the median age of Australian farmers reached a minimum in 1981, and has been increasing at a uniform rate over the following two decades, passing 50 years in the 2001 census year. This steady increase followed a period between 1954–1976 during which median farmer ages rose significantly during only one intercensal period, between 1954–1971[1] (McAllister & Walker 1980).

4.10 MEDIAN AUSTRALIAN FARMER AGE — 1976–2001



Industry differences in age profile

Estimates of age of farmers based upon CPH are lower than estimates produced by ABARE, though both show the same trend of increasing age. Garnaut and Helali (1999) used ABARE's farm survey data to estimate the average age of farmers for the period 1981/82 to 1996/97. After adjusting their data to overcome the effects of the ABARE sampling procedure, these authors found the average age of principle decision makers in broadacre agriculture was 52 years in 1996. Two reasons are advanced for this difference. Garnaut and Helali included only principal decision-makers in their estimate. It is probable that our estimate based upon CPH counts includes younger partners in multi-generational businesses.

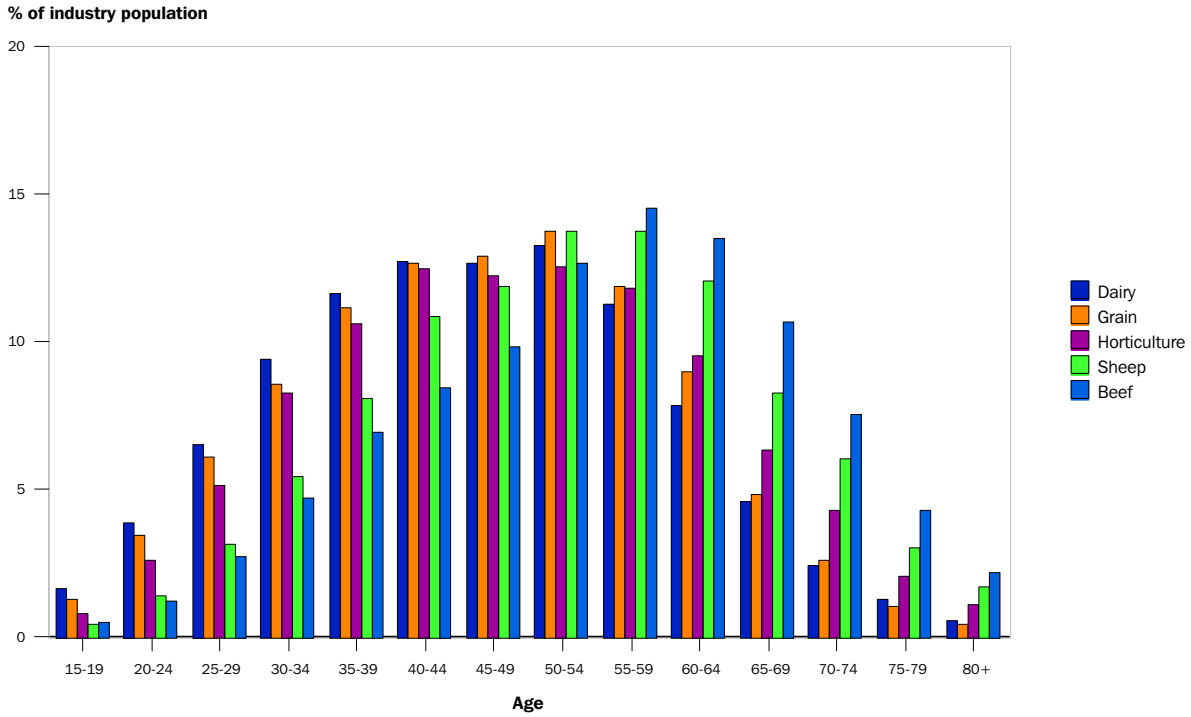
Another difference is due to the subset of agricultural industries included in the ABARE farm surveys. In particular, horticultural industries are not sampled. Graph 4.11 shows the age distribution of major agricultural industries in 2001. There are clear age differences, with the beef, and to a lesser extent the sheep

[1] McAllister and Walker's data was for the male farm workforce for Victoria.

industries, having an aged profile skewed towards older age groups. The absence of horticulture from ABARE age estimates is likely to produce a higher estimate of Australian farmer age.

The differing age profiles of agricultural industries suggests that the increasing median age of Australian farmers may be due to differential adjustment patterns within industries. The dairy industry has the youngest age profile of the major agricultural industries. There has been considerable consolidation of businesses within the dairy industry over the past decade. This consolidation may reduce the count of younger farmers. Farmer counts in the beef and sheep industries are dominated by farmers on small properties in higher rainfall regions. Farm consolidation is less common in these regions and entry of younger persons is also uncommon (Barr, Wilkinson & Karunaratne 2002; Wilkinson, Barr & Karunaratne 2002).

4.11 FARMER AGE DISTRIBUTION BY AGRICULTURAL INDUSTRY IN 2001



Higher median age in regions with many small scale farms

Farmer age is generally greater in the high rainfall grazing districts along the Great Dividing Range of eastern Australia and along the coastal fringe. The median age in the Southern Hill Country region was over 53 years, and in the Northern Beef Zone was over 51 years (graph 4.12). These are regions where the predominant agricultural land use is grazing. It is in this zone that the majority of the nation's small beef farms are located. Grazing industries, and beef production in particular, have a lower labour requirement than other agricultural industries. Beef producers are far less likely to retire from active

farming than dairy farmers or horticulturalists. They are more likely to remain on the farm and gradually reduce labour commitments. Their location in regions of high amenity and relatively high land prices limits options for improving productivity through increasing business size. This, in turn, limits the options for younger persons to enter agriculture (Barr & Karunaratne 2002).

Farmer median ages were lowest in two regions where farm businesses have the advantage of scale or recent favourable market conditions. Most notable were the West Australian Cropping zone, Southern Irrigated Cropping and Irrigated Horticulture regions.

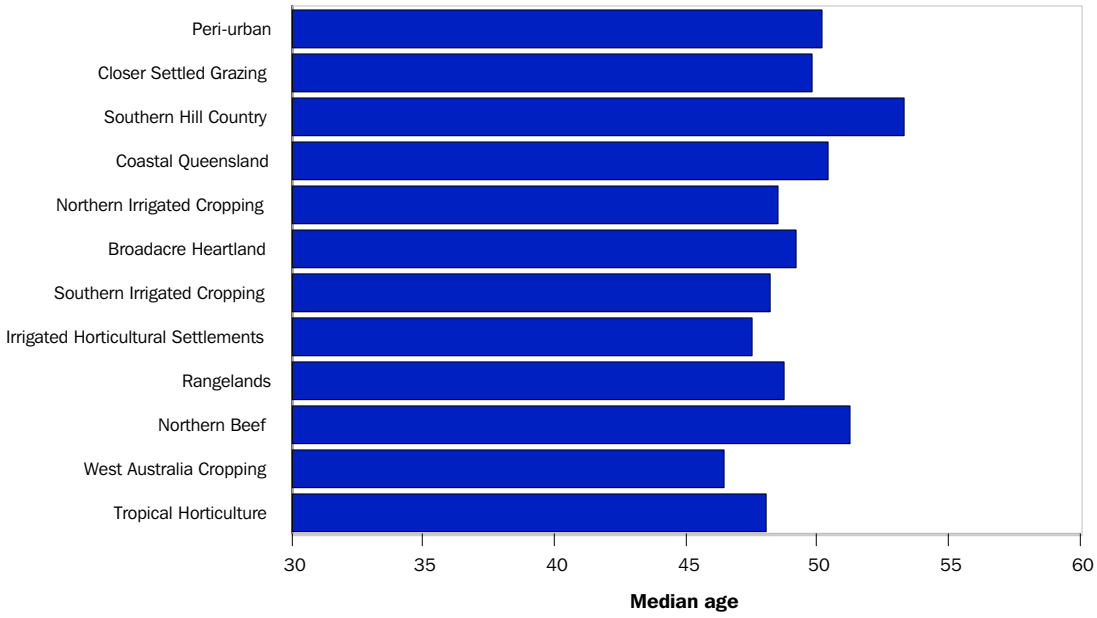
Median age increases greatest in amenity and dryland farming regions

Increases in median farmer age in the most recent intercensal period were highest (greater than two years) in those regions in which farmer counts are dominated by large numbers of smaller farm businesses and also in broadacre cropping regions. The former group included the two regions with highest median ages; Southern Hill Country and Northern Beef regions, but also the Peri-urban and coastal Queensland regions. Similar sized aged increases occurred in the West Australian Cropping region and the Closer Settled Grazing regions.

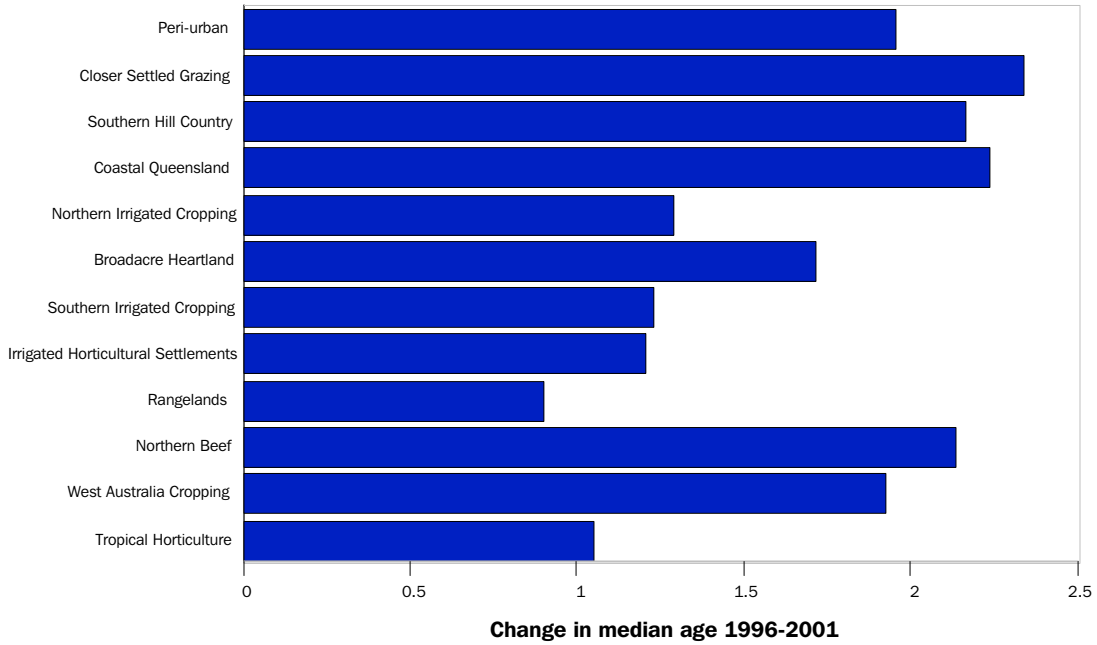
Small increases in median age in irrigation regions

Low increases in median age occurred in four mainly irrigation regions and the Rangelands region. Changes in median age in the Rangelands region appear quite unstable, with this same region recording a quite large increase in median age in the previous intercensal period.

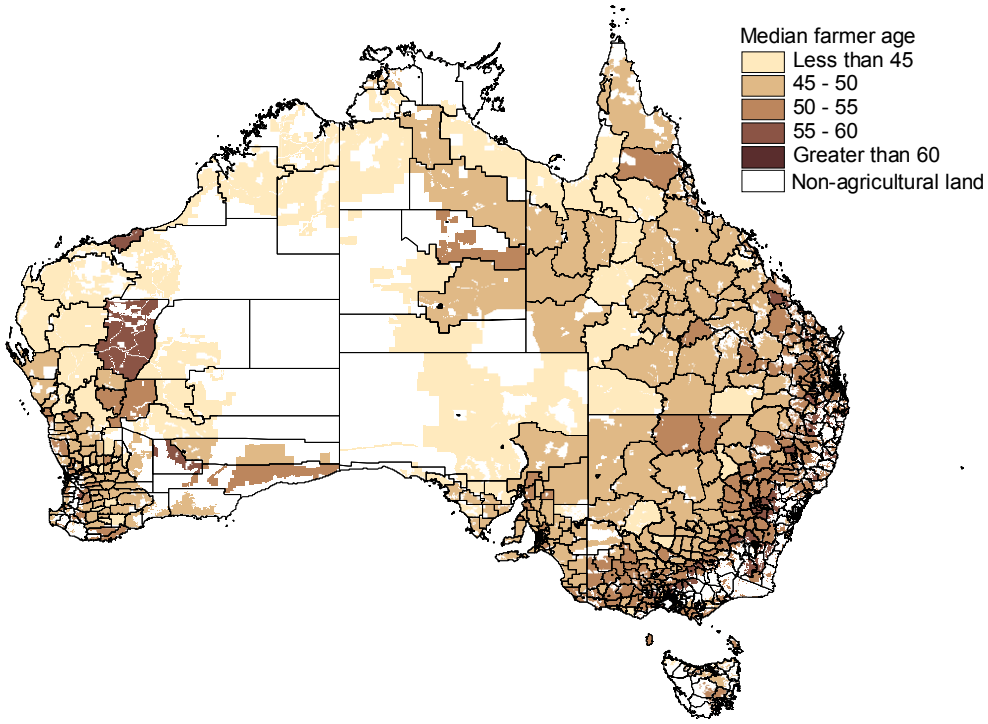
4.12 MEDIAN FARMER AGE IN 2001 BY CLUSTER REGION



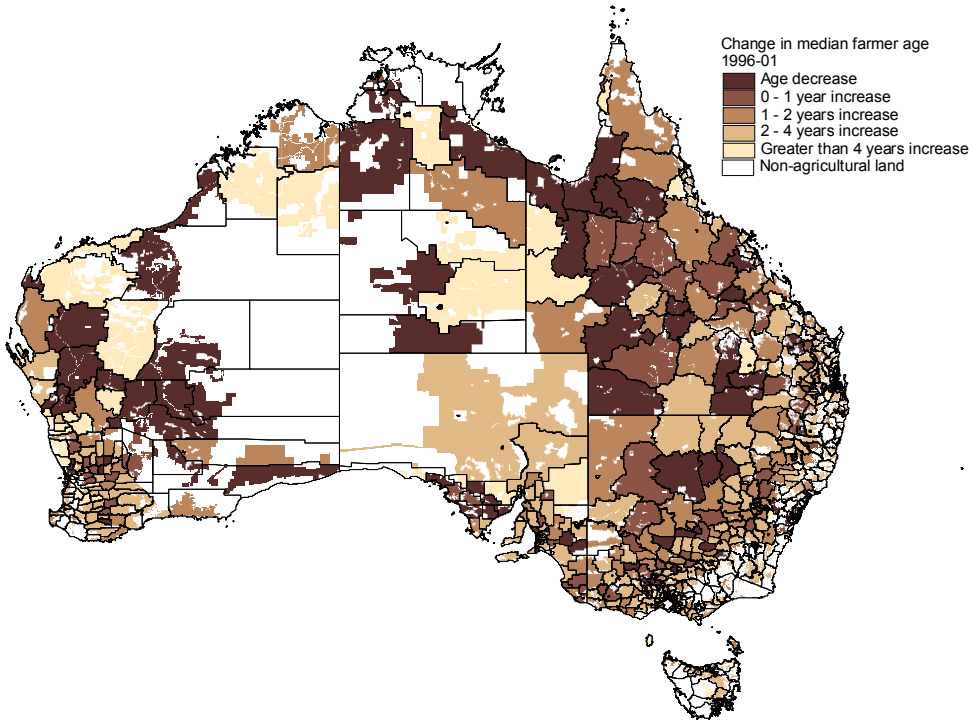
4.13 MEAN CHANGE IN FARMER AGE BETWEEN 1996 AND 2001 BY CLUSTER REGION



4.14 MEDIAN AGE OF FARMERS BY SLA — 2001



4.15 CHANGE IN MEDIAN AGE OF FARMERS BY SLA — 1996–2001



CHAPTER 5 MODELLING OF ADJUSTMENT IN AUSTRALIAN AGRICULTURE .....

In this final section we aim to use 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 this work we drew on the work of Clawson and other demographic research in the USA and Canada that has shown that the patterns of exit for each age group remain relatively fixed over time. That is, a cohort of farmers within a region who are aged 35–39 years in 1996 will have similar exit patterns in 2006 to that displayed by farmers aged 45–49 years in that same region in 1996 assuming similar commodity price and seasonal conditions (Tolley & Hjort 1963; Kanel 1964; Smith 1987; Gale 1996; Gale 2003). This assumption is partly supported by our own analysis of longitudinal exit rate data (graph 3.14).

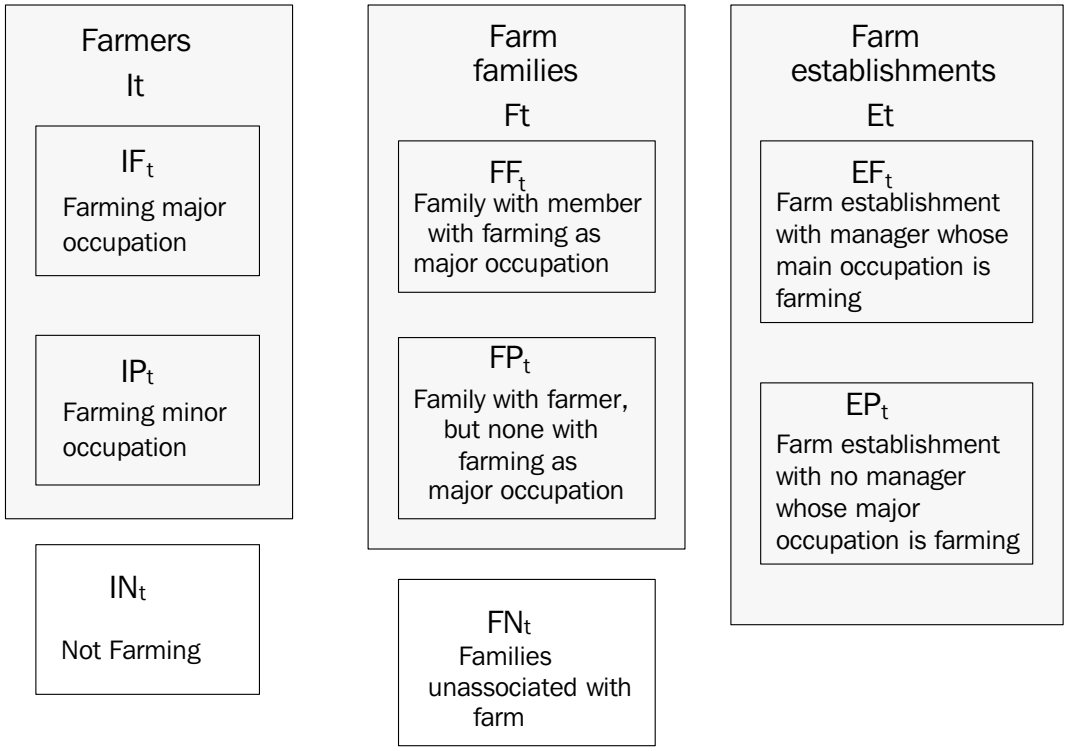
ENTITY STRUCTURES: FARMS AND FARMERS

Enumeration of the structure of the farm sector can be based upon three entities using data from national collections:

- Individuals (farmers)
- Families (farm families)
- Establishments (approximately farm businesses)

This enumeration is complicated by the multi-occupational nature of modern Australian farming. The resulting structure of farm sector entities at time *t* is portrayed in figure 5.1.

5.1 ENTITY STRUCTURE OF AUSTRALIAN FARMING



It is not possible to create counts of each of these entities. The following entities are available from existing data sources:

- **IF$_t$:** This a count of persons nominating farm management as major occupation at time *t*. This count has been available for previous and present Population and Housing Censuses.
- **FF$_t$:** A count of families (or households) with at least one member nominating farming as their main occupation derived by custom tables using family structure and OCCP. This count has been available for previous and present censuses.
- **E$_t$:** A count of farm establishments derived from the AAS. This count has been available from all AAC years. The ABS uses the data collected within its Farm Census to create a measure of farm size called EVAO. Further details are provided in Appendix 2.
- **EF$_t$**: A count of establishments with at least one manager/operator who describes farming as their main occupation. In 2001 the AAC form asked whether the person who managed the establishment had farming as their main occupation. The wording used was as close as possible to the major occupation question used in the CPH. This will provide for the first time a reasonably accurate count of the number of establishments managed by a person whose main occupation is farming. This count is not available for previous agricultural censuses.

- EP_t: A count of establishments without a manager or operator who describes farming as their main occupation. This is also only available for 2001 data.

For the remaining entities there are no estimates.

- **IP_t**: This is a count of persons operating a farm who nominate an occupation other than agriculture as their main occupation.
- **I_t:** This is the count of all individuals having farming as either a minor or major occupation.
- **FP_t:** This is a count of families with no members nominating farming as their main occupation, but with at least one member for whom farming is a minor occupation.
- **F_t:** This is the count of all families with at least one member having farming as either a minor or major occupation.

BASIC ENTITY RELATIONSHIPS

The relationships between these entities can be summarised as follows:

$$I_t = IF_t + IP_t$$

$$F_t = FF_t + FP_t$$

$$E_t = EF_t + EP_t$$

Farm families can have more than one person whose main occupation is farming. Most commonly this will be a husband and wife team. It is also common for families to include parent and offspring farmers. The nature of this relationship can be determined for SLA or larger geography using enumerated count data available from the ABS. In 2001 the ratio of IF_t to FF_t across Australia was 1.4.

$$I_t \geq F_t$$

$$IF_t \geq FF_t$$

Establishments with at least one person whose major occupation is farming can be associated with more than one farming family. In 2001 the ratio between FF_t and EF_t was 1.12. Unlike the Canadians or Israelis, Australian researchers have no access data linkages between the AAC establishment entity and the CPH farmer or family entities. This effectively limits our capacity to use establishment data in a model of structural change in agriculture.

$$FF_t \geq EF_t$$

A second weakness of the current data available for the census is the inability to identify multi-occupational farmers. As noted earlier, there is no count for the entity IP_t. A number of estimates can be made using some simplifying assumptions, however, these estimates have major shortcomings and are of very limited utility for the building of a model. The first estimate of IP_t can be based upon a very simple assumption:

$$IP_t \approx FP_t \approx EP_t$$

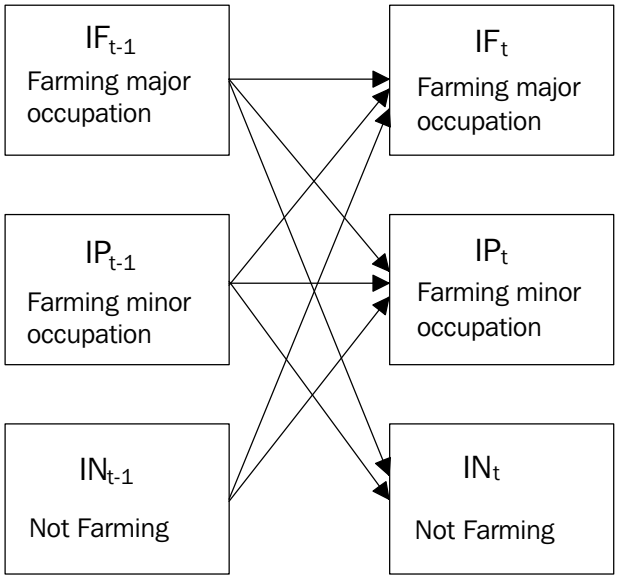
This relationship is based upon an argument that most farms without a major occupation farmer will be small and are unlikely to require the involvement of more than one family or more than one farmer. When considering occupational mobility in and out of farming, this assumption appears reasonable. It is extremely unlikely that a small farm will be associated with the occupational migration of two persons into farming as their major occupation within one intercensal period.

These relationships are explored in greater detail in Appendix 2.

A CONCEPTUAL MODEL OF ADJUSTMENT

The adjustment of agriculture can be represented by depicting the changes in state of individuals between time t-1 and time t. The case for individuals is represented in figure 5.2.

5.2 CONCEPTUAL MODEL OF AGRICULTURAL ADJUSTMENT USING FARMER ENTITY



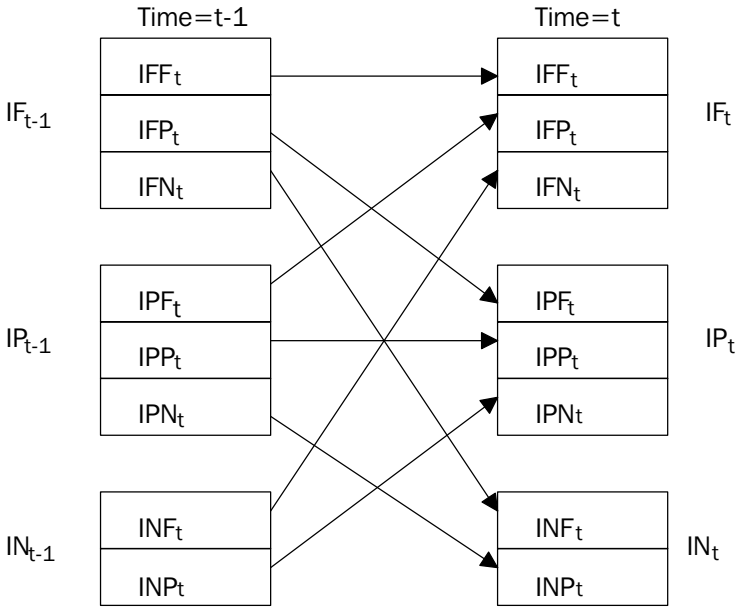
This model can be broken down into components to represent each of the intercensal flows. The above figure depicts these relationships using a four letter variable naming convention in which the first letter depicts the entity of measurement, the second indicates the state in the previous census, the third indicates the state in the current census and the final letter indicates the time period. Thus IPF_t is the number of individuals who shifted from farming as a minor occupation in the previous census to farming as a major occupation in the census at time t. This model provides a number of simple equations that

describe states in time t and time t-1 in terms of the component flows from and to each of these states. For example:

$$IF_t = IFF_t + IPF_t + INF_t$$

There are another five of these equations. The reader is left to construct these if they wish.

5.3 SEGMENTED MODEL OF INDIVIDUAL ADJUSTMENT



These six equations do not allow the construction of estimates of the flow parameters because of the inability to obtain counts of persons for whom farming is a minor occupation. Such calculations will only be possible if longitudinal data of multi-occupationality becomes available from the Census of Population and Housing.

This requires the model to be simplified to include only measurable components (figure 5.4). The stock is the census year count of farmers who nominate farming as their main occupation. The flows between each census year correspond with the simple measures of entry to farming, exit from farming and continuing in farming that are described in earlier sections of this report. The key simplifications of this model are:

- We have combined exit from farming and conversion from farming, as a major occupation to farming as a minor occupation status, in the same aggregate measure of exit from farming;

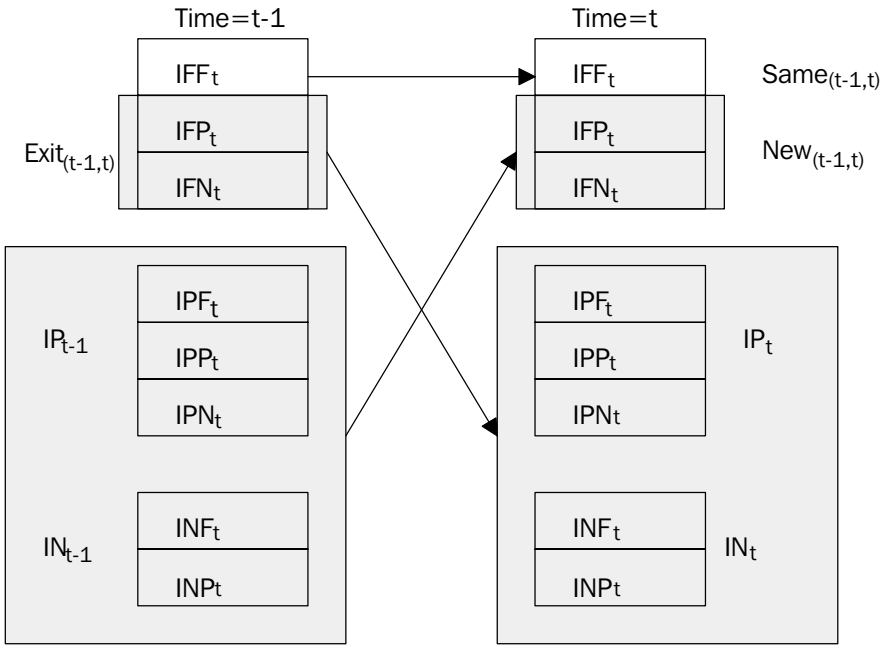
$$Exit_{(t-1,t)} = IFP_t + IFN_t$$

- We have combined entry to farming and conversion from farming as a minor occupation to farming as a major occupation status within the single measure of entry to farming;

$$New_{(t-1,t)} = IPF_t + INF_t$$

- We have ignored any change in farm establishment status associated with changing occupational status.

5.4 SIMPLIFIED CONCEPTUAL MODEL OF CHANGE



This simple model can be operationalised by using historic measures of Entry, Exit and Same (continued farming) to create a projection of future farmer populations. To achieve this, the value of Exit for time t can be expressed as a linear function of farmer population at time t-1.

$$Exit_{(t-1,t)} = k\ IF_{(t-1)}$$

where k is estimated from previous intercensal periods.

The value of New can be estimated as a function of the number of exits in the intercensal period. The greater the number of exits, the greater the opportunity for others to enter agriculture.

$$New_{(t-1,t)} = j\ Exit_{(t-1,t)}$$

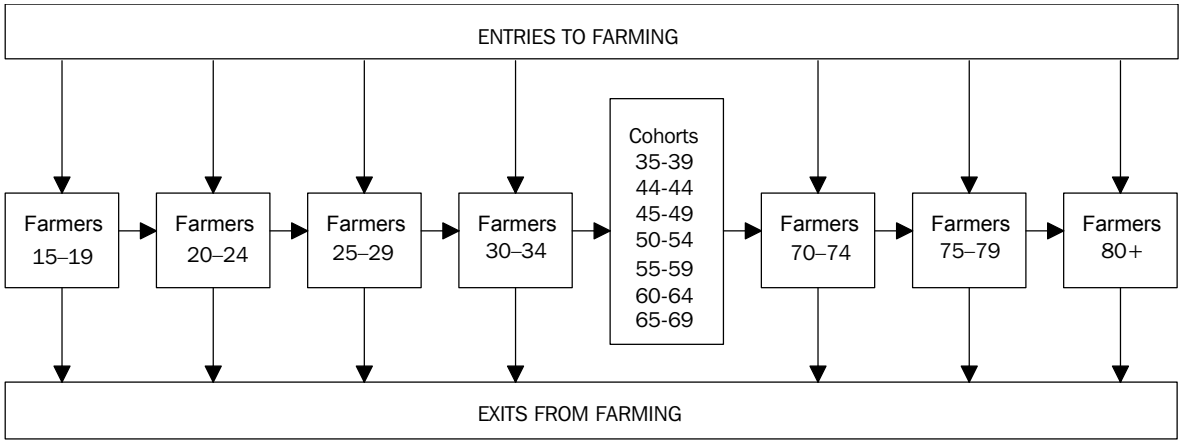
where j is estimated from previous intercensal periods.

Estimation of Same $_{(t-1,\ t)}$ is trivial.

$$Same_{(t-1,t)} = IF_{(t-1)} - Exit_{(t-1,t)}$$

This simple model overlooks the very strong relation between entry and exit behaviour and age (map 4.14). The model can be enhanced by creating stock variables for each 5-year age cohort between 15–80 years and a stock variable for farmers aged 80 years and over. This enhanced model is represented in figure 5.5.

5.5 ADJUSTMENT MODEL BASED UPON 5 YEAR AGE COHORTS



OPERATIONALISING THE MODEL

This simple model is operationalised by using historic measures of Entry, Exit and Same (continued farming) to create a projection of future farmer populations. To achieve this, the value of Exit for age groups 20–24 years to 80–84 years at time t can be expressed as a linear function of population of that same cohort at time t-1.

$$\mathbf{Exit}_{(t\text{-}1,t)} = k\ \mathbf{IF}_{(t\text{-}1)}$$

where

$\text{Exit}_{(t\text{-}1,t)}$ is the number of farmers aged t to t+5 exiting farming between time t-1 and time t

k is estimated from previous intercensal periods for age group t to t+5

$\text{IF}_{(t\text{-}1)}$ is the count of individuals whose main occupation is farming at time t-1

No exit value is defined for any age cohort during age 15–19 years. Any count of farmer population for that age group is effectively a measure of net entry.

Entry to farming is not a function of the existing population of farmers. A major 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. This tells us that entry of farmers will in part be represented as:

$$\text{Entry}_{(t-1,t)} = j\ \text{Exit}_{(t-1,t)}$$

where

$\text{Entry}_{(t-1,t)}$ is the number of farmers aged t to t+5 exiting farming between time t-1 and time t

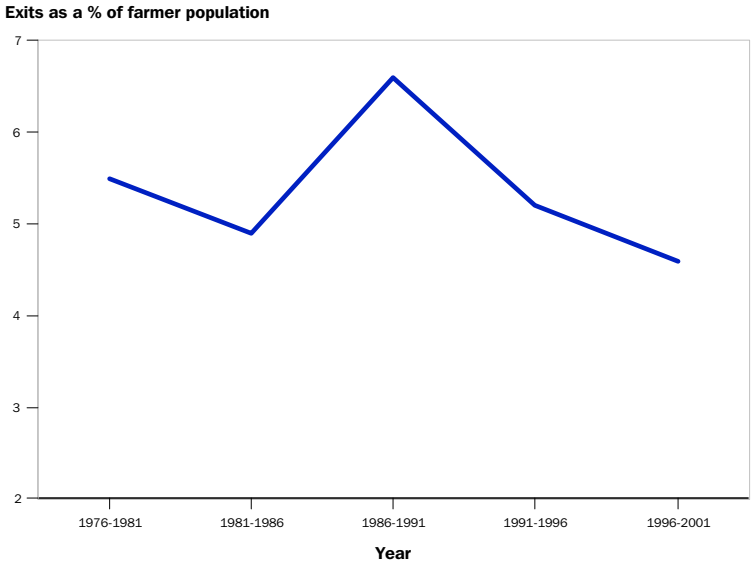
$\text{Exit}_{(t-1,t)}$ is the number of farmers aged t to t+5 exiting farming between time t-1 and time t

j is estimated from previous intercensal periods for age group t to t+5

The parameter j is an estimate of the relative competitiveness of established farmers and intending new entrants in the farm land market. This parameter may not relate to the entry of younger persons. The entry of younger farmers is often by joining an existing family business. Entry is not immediately associated with the purchase of a farm. In fact, the entry of younger farmers may lead to a later decision by the farm business to purchase further land, in competition with intending new entrants. We chose to calculate the number of new entrants in the 15–19 years age group as a proportion of the total farm population aged between 40–55 years.

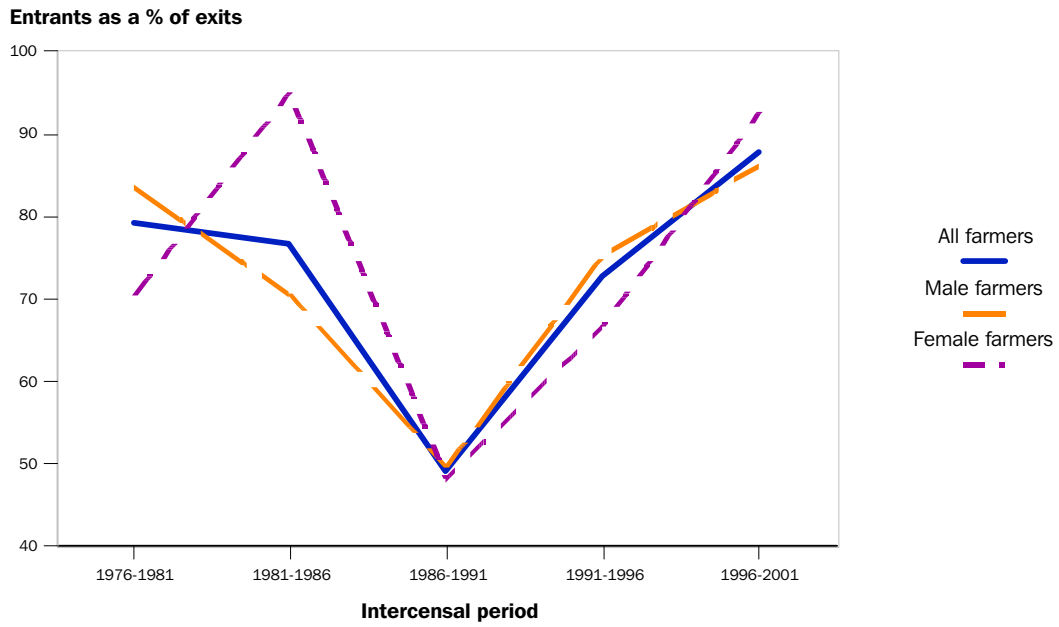
The simplest and most defensible choice of values for the parameters j and k is to use historic values of previous intercensal periods. This leads to the question of whether these parameters are stable, and if not, whether they are subject to cyclical variation or longer term changes in value. The ratio of exits to farmer population is shown again in graph 5.6. With the exception of the 1986–1991 intercensal period, the rate of exit from farming has ranged between 5.5% and 4.5%. Is the elevated rate for 1986–1991 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 is more appropriate.

5.6 FARMER EXITS AS A PERCENTAGE OF TOTAL FARMER POPULATION



The other major parameter for the model is the ratio of farm entries to farm exits. Historic values for this parameter are portrayed in graph 5.7. Once again, the intercensal period of 1986–1991 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 the most recent intercensal period and the average parameters for the past three intercensal periods.

5.7 ENTRIES TO FARMING AS A PERCENTAGE OF EXITS FROM FARMING IN THE SAME INTERCENSAL 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 are markedly different entry and exit behaviour of farmers in different agricultural industries (Barr, Karunaratne & Wilkinson 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.

Geographic segmentation is a far more tractable challenge. It is possible to estimate values of j and k for SLA based data, the lowest level of 'place of enumeration' data aggregation available from the population census. These estimates will be unreliable for the many 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 11 of the 12

agricultural regions described on pages 8–10 and 69[1]. Many of these regions are characterised by a relatively homogenous agricultural structure, allowing some insights into the potential demographic futures of some agricultural industries.

PROJECTED FUTURE DEMOGRAPHIC STRUCTURES: AUSTRALIA

The outputs of the two model runs are summarised in graphs 5.8 and 5.9. The two choices of parameters give markedly differing outcomes in projections of total farmer numbers to 2031. Ignoring the adjustment behaviour of the 1986–1991 intercensal period results in a relatively stable farmer population, declining to 170,000 by 2031. The inclusion of the 1986–1991 intercensal period in the calculation of model parameters results in much more marked decline, to less than 120,000 farmers in 2031.

A sharper decline in farmer numbers is associated with a less pronounced increase in the median age of farmers. Since 1981 farmer age has been rising steadily. Our projections suggest this rise will continue for another decade before a gentle decline commences. The choice of model parameters makes only a small difference in the maximum median age. This peaking in the median age of farmers around 2011 may be the result of a number of influences on the structure of the farm population and some potential shortcomings in our model.

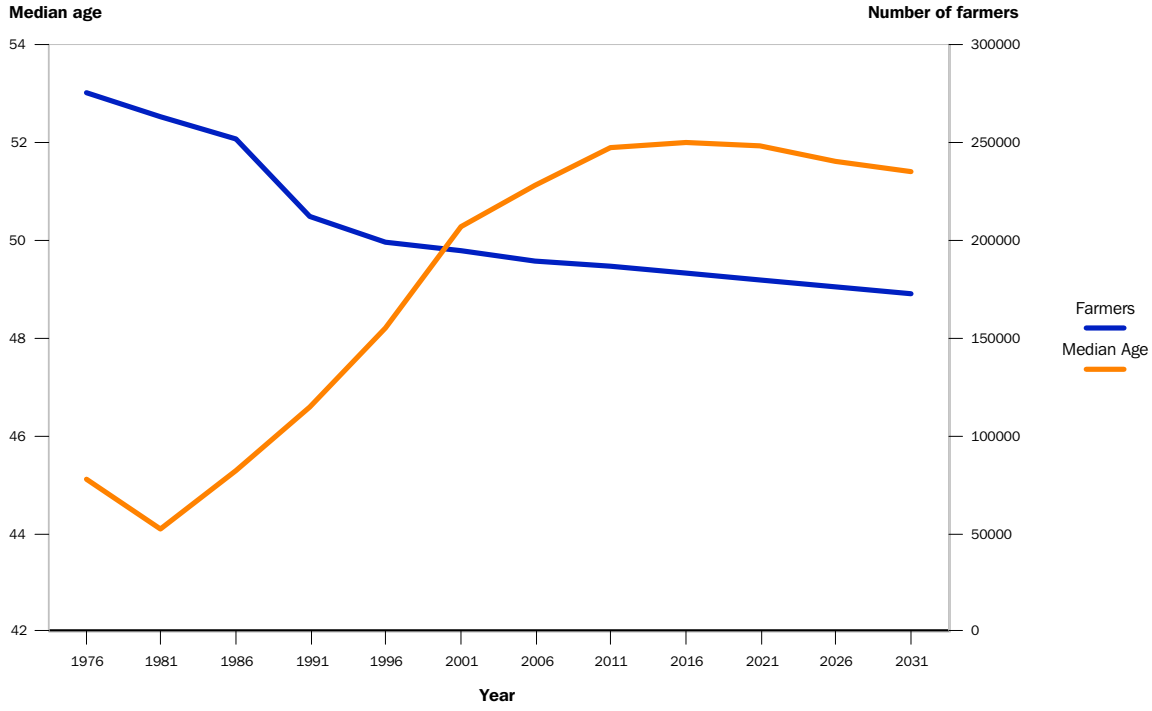
- The main factor driving the increasing average age of the farm population is the declining rate of entry of younger persons to the occupation. The evidence from page 18 is that the pattern of younger entry has now stabilised. Entry by persons under 25 years of age is now relatively uncommon. Entry is spread reasonably evenly between the ages of 30–55 years. It remains for the farmers entering in this new entry pattern to be propagated through the age structure. This factor will have little influence on median age after the 2011 census.
- 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, Karunaratne & Wilinson 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 years 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 years, 40–44 years,

1 The Tropical Horticulture region is excluded due to the small count of farmers.

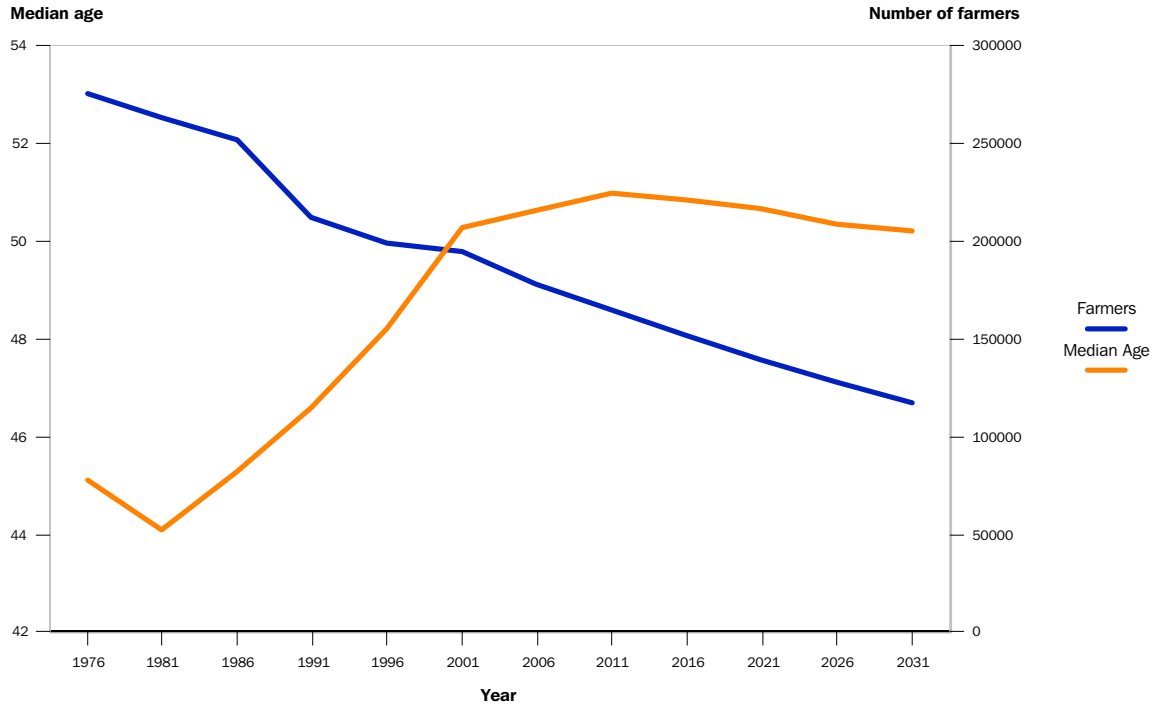
45–49 years and now 50–55 years age groups. After 2011 we can expect these farmers to be retiring, resulting in a gradual decline in the median age of sheep farmers.

The underlying problem in creating our model has been the uncertainty in differentiating cyclical changes in farmer adjustment behaviour from longer-term permanent changes in behaviour. The census of 2006 will test our assumptions of the stability of current entry patterns and also indicate whether the 1991 exit rates are an aberration or a release of pent-up adjustment decisions during a period of rising land prices.

5.8 HISTORIC AND MODELLED FUTURE FARMER POPULATION AND MEDIAN AGE USING PARAMETERS DERIVED FROM THE 1996–2001 INTERCENSAL PERIOD



5.9 HISTORIC AND MODELLED FUTURE FARMER POPULATION AND MEDIAN AGE USING PARAMETERS DERIVED FROM THE 1986–2001 INTERCENSAL PERIODS



PROJECTED FUTURE DEMOGRAPHIC STRUCTURES: THE REGIONS

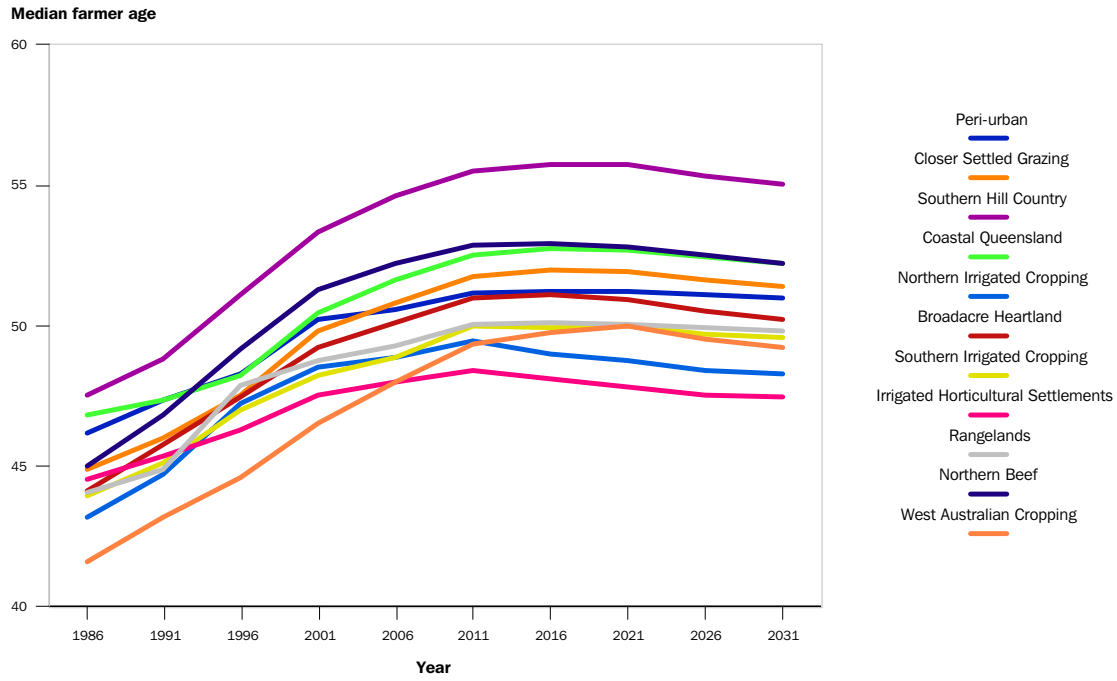
Graphs 5.10 to 5.13 portray the outcome of modelling for agricultural regions of Australia.

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 are areas where landscape amenity and lifestyle choices by the non-farming community are less likely to influence the structure of the farm sector.

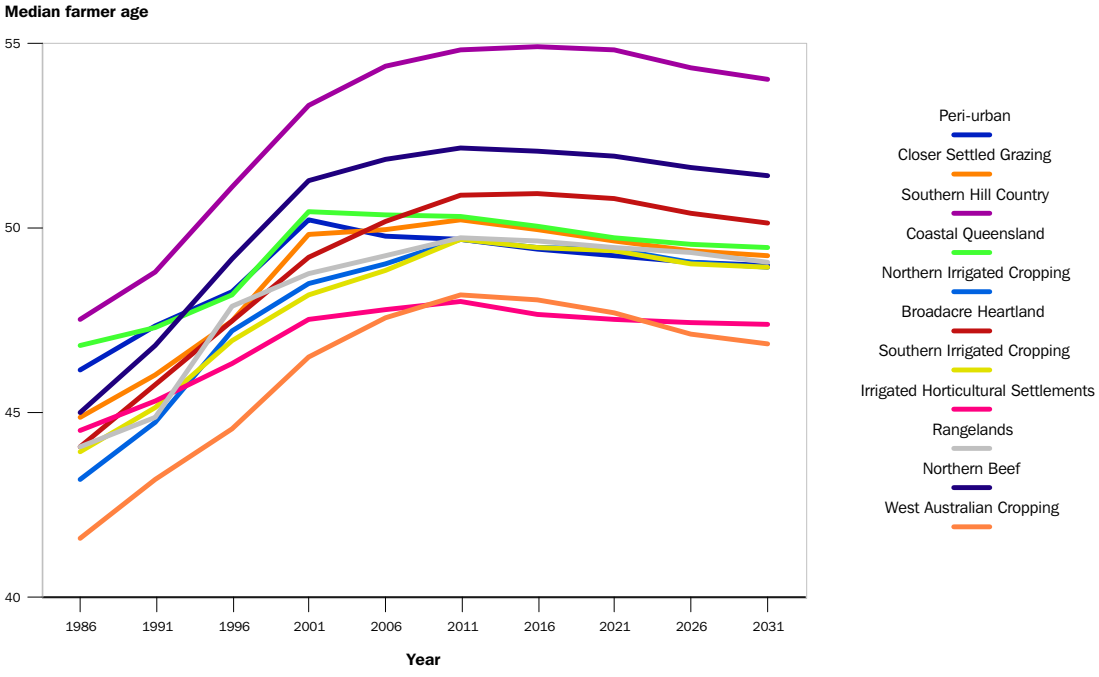
The choice of model parameters has a large effect on the pattern of adjustment in some regions and little impact in others. The effect is least with the West Australian Cropping and the Closer Settled Grazing zones. In each of these regions there are many financially large agricultural businesses with 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.

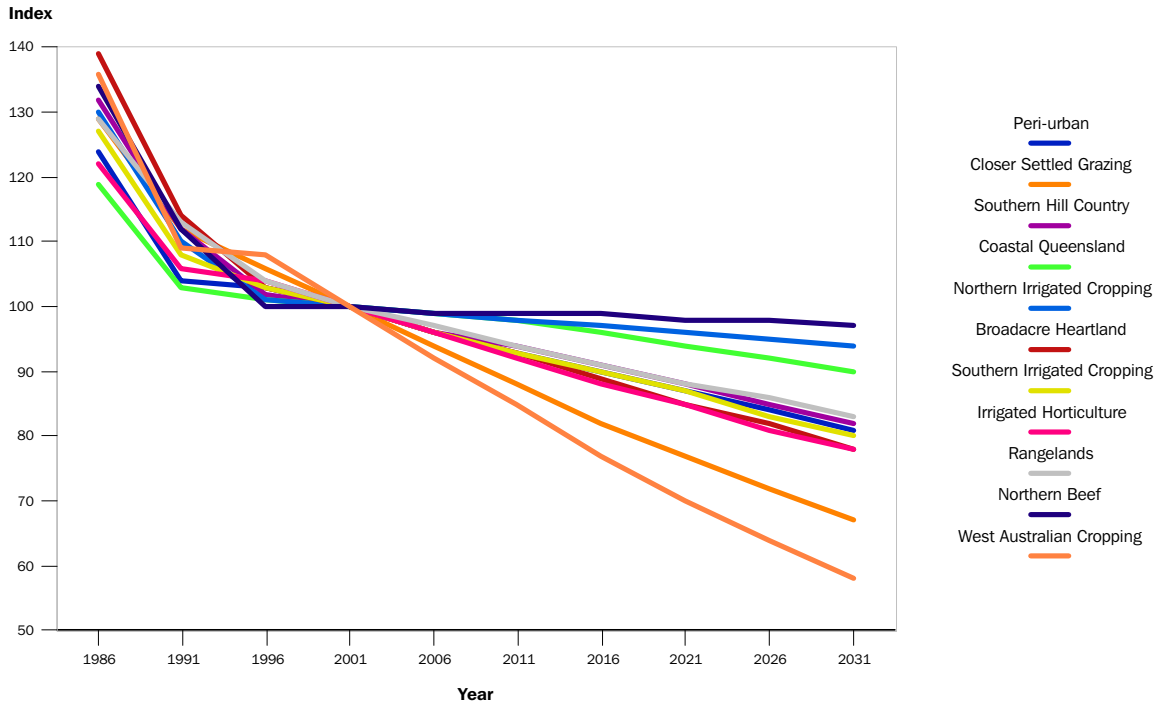
5.10 HISTORIC AND PROJECTED MEDIAN FARMER AGE FOR SELECTED AGRICULTURAL REGIONS USING PARAMETERS BASED UPON 1996–2001 INTERCENSAL PERIOD



5.11 PROJECTED MEDIAN FARMER AGE FOR SELECTED AGRICULTURAL REGIONS USING PARAMETERS BASED UPON 1986–2001 INTERCENSAL PERIODS

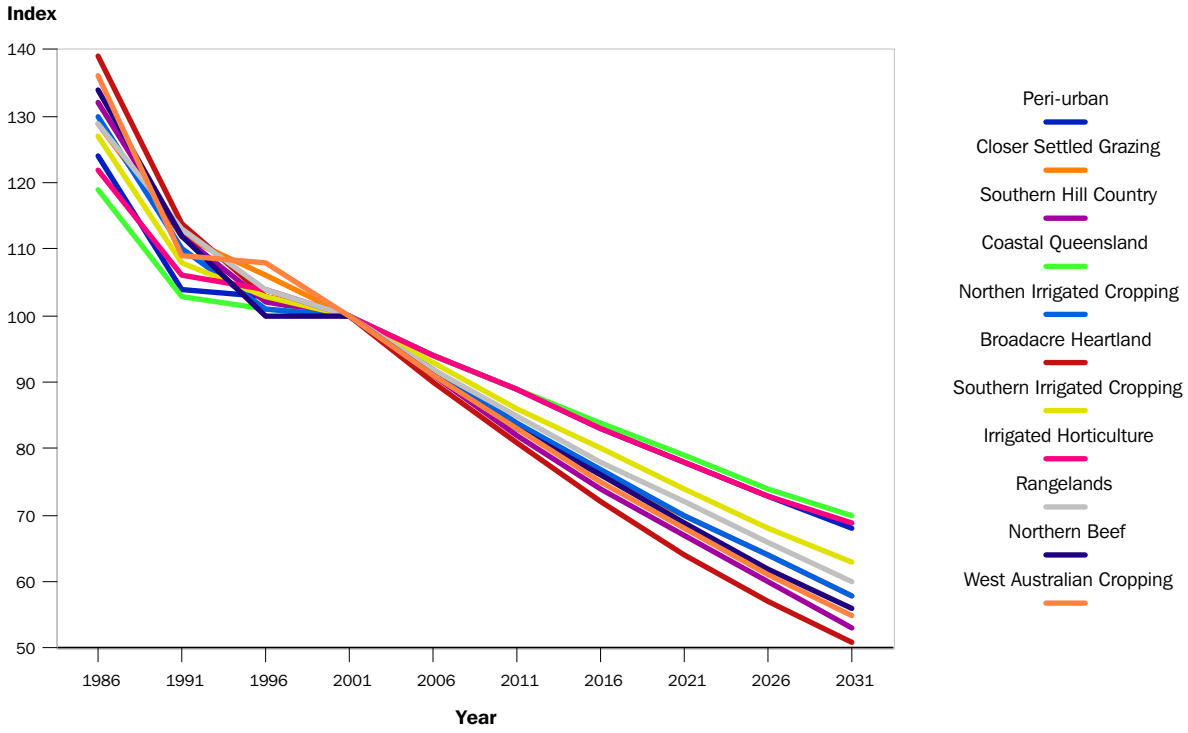


5.12 PROJECTED FARMER POPULATION FOR SELECTED AGRICULTURAL REGIONS USING PARAMETERS BASED UPON 1996–2001 INTERCENSAL PERIOD



	1986	*1991*	*1996*	*2001*	*2006*	*2011*	*2016*	*2021*	*2026*	*2031*
Peri-urban	124	104	103	100	96	93	90	87	84	81
Closer Settled Grazing	129	112	106	100	94	88	82	77	72	67
Southern Hill Country	132	112	102	100	96	94	91	88	85	82
Coastal Queensland	119	103	101	100	99	98	96	94	92	90
Northern Irrigated Cropping	130	110	101	100	99	98	97	96	95	94
Broadacre Heartland	139	114	103	100	96	93	89	85	82	78
Southern Irrigated Cropping	127	108	103	100	96	93	90	87	83	80
Irrigated Horticultural Settlements	122	106	104	100	96	92	88	85	81	78
Rangelands	129	113	104	100	97	94	91	88	86	83
Northern Beef	134	112	100	100	99	99	99	98	98	97
West Australian Cropping	136	109	108	100	92	85	77	70	64	58

5.13 PROJECTED FARMER POPULATION FOR SELECTED AGRICULTURAL REGIONS USING PARAMETERS BASED UPON 1986–2001 INTERCENSAL PERIODS



	1986	*1991*	*1996*	*2001*	*2006*	*2011*	*2016*	*2021*	*2026*	*2031*
Peri-urban	124	104	103	100	94	89	83	78	73	68
Closer Settled Grazing	129	112	106	100	92	84	76	70	64	58
Southern Hill Country	132	112	102	100	91	82	74	67	60	53
Coastal Queensland	119	103	101	100	94	89	84	79	74	70
Northern Irrigated Cropping	130	110	101	100	92	84	77	70	64	58
Broadacre Heartland	139	114	103	100	90	81	72	64	57	51
Southern Irrigated Cropping	127	108	103	100	93	86	80	74	68	63
Irrigated Horticultural Settlements	122	106	104	100	94	89	83	78	73	69
Rangelands	129	113	104	100	92	85	78	72	66	60
Northern Beef	134	112	100	100	91	83	76	69	62	56
West Australian Cropping	136	109	108	100	91	83	75	68	61	55

CHAPTER 6 THE SUSTAINABILITY OF FARM COMMUNITIES

The transformation of farming areas is often a cause of disquiet in rural communities. Particular issues of concern are:

- the decline of population on farms and in rural small towns
- the loss of young persons from farming and rural areas (and the associated increasing average age of the community)
- incremental infringements upon a perceived 'right to farm'.

These are not isolated issues, but are different facets of the fate of agriculture in a modern economy.

DECLINE OF FARM POPULATIONS

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 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 scale of business activity. 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.

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%. The number of dairy cows has hardly changed and the number of dairy farmers has decreased by 80% (DRDC 2003). These trends are obvious not only in Australia, but in other developed nations (Anon 2000; Economic Research Service 1997; Freshwater 2000).

THE EXODUS OF THE YOUNG

Declining populations in Australian farm communities are not a result of persons abandoning failed farm businesses. Farm family businesses are remarkably 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 investment 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 farmers 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 everywhere (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 focused 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.

THE 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. The political influence of the farming lobby will decline. 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 1999; Ellyard 1998). Again, Australia is reflecting international trends. In the ecological economics literature there is an ongoing 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)[1].

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. 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 was the best predictor of rural area population change (McGranahan 1999). In landscapes with few widely valued amenity characteristics, agriculture remained the dominant economic activity and population decline was the norm (McGranahan & Beale 2002). In these areas agricultural businesses are in competition with each other in the quest for land and increased productivity.

In districts where there is an amenity demand for land, higher land prices restrict the capacity of many agricultural businesses to increase scale to maintain competitiveness. They are also likely to feel constraints upon their license to operate, often resulting in public debates about the 'right to farm'. Despite the high prices, 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).

1 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).

Evidence of these trends can be seen in the data presented in graph 3.14 and graph 5.7. These show a deferral of retirement by increasing numbers of older farmers and the increasing proportion of farmers being replaced by new farmers.

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.

DIVERGING SOCIAL LANDSCAPE TRAJECTORIES

Demographic research of Australia's rural regions inevitably shows the diversity of community situations (Haberkorn et al. 1999). Agricultural systems show a similar diversity, and this diversity is an outcome of the interaction between agricultural commodity economic systems and urbanisation of the Australian community. The divergent trajectories of agricultural Australia are exemplified by the fate of three of the regions we have examined: the West Australian Wheat belt, the Southern Hill Country and Peri-urban agriculture.

The landscapes of the Western Australian wheat belt offer the greatest opportunities for farm businesses to keep ahead of declining terms of trade. The main agricultural advantage is not better soils[2], or better rainfall, but the lack of competition from other land purchasers. Those who want to buy land in these landscapes, are, almost without exception, cropping farmers. Those few who may wish to enter are, paradoxically, constrained by the large size of farms created by a continuing ability to aggregate. 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 1997c). 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 that 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.

In the Southern Hill Country we often see the price of land pushed higher than farm businesses can afford to pay if they adopt a business perspective to their land purchases (Barr & Karunaratne 2001). Farming industries in this region are characterised by small properties, an older farm population and little farm aggregation. Younger households generally rely on off-farm income. The predominant industry is often beef production. This enterprise makes low demands on labour, allowing production in conjunction with off-farm

2 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.

employment or on-farm semi-retirement. 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. Properties will often be purchased by in-migrants. Small towns in this region are not necessarily condemned to slow decline. Their future can be secure because of the landscape amenity, or because of particular cultural associations that encourage a cultural migration. With community sustainability comes the seeds of farm financial unsustainability.

In the Peri-urban area, land values make all but the most capital-intensive agriculture a poor business investment. Intensive agriculture occupies a relatively small area, but makes an important economic contribution that is not fully counted by current statistical collections (Houston 2003). The Peri-urban areas are where the greatest intensification of agriculture occurred over the past 15 years (National Land and Water Resources Audit 2001). Intensive agriculture is often incompatible with the quiet enjoyment of amenity expected by nearby residents. It is not nearly as desirable a neighbour as that much more pleasant outlook provided by grass based agriculture. It is in these landscapes that the 'right to farm' debate is most intense and where concern about declining populations is replaced by concern over the loss of 'prime agricultural land'.

APPENDIX 1 THE REGIONAL CLASSIFICATION.....

A1.1 ESTABLISHMENTS, FARMERS AND FARM FAMILIES IN EACH CLUSTER REGION

Region	*Total establishments with EVAO greater than $5,000 (1996$) 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

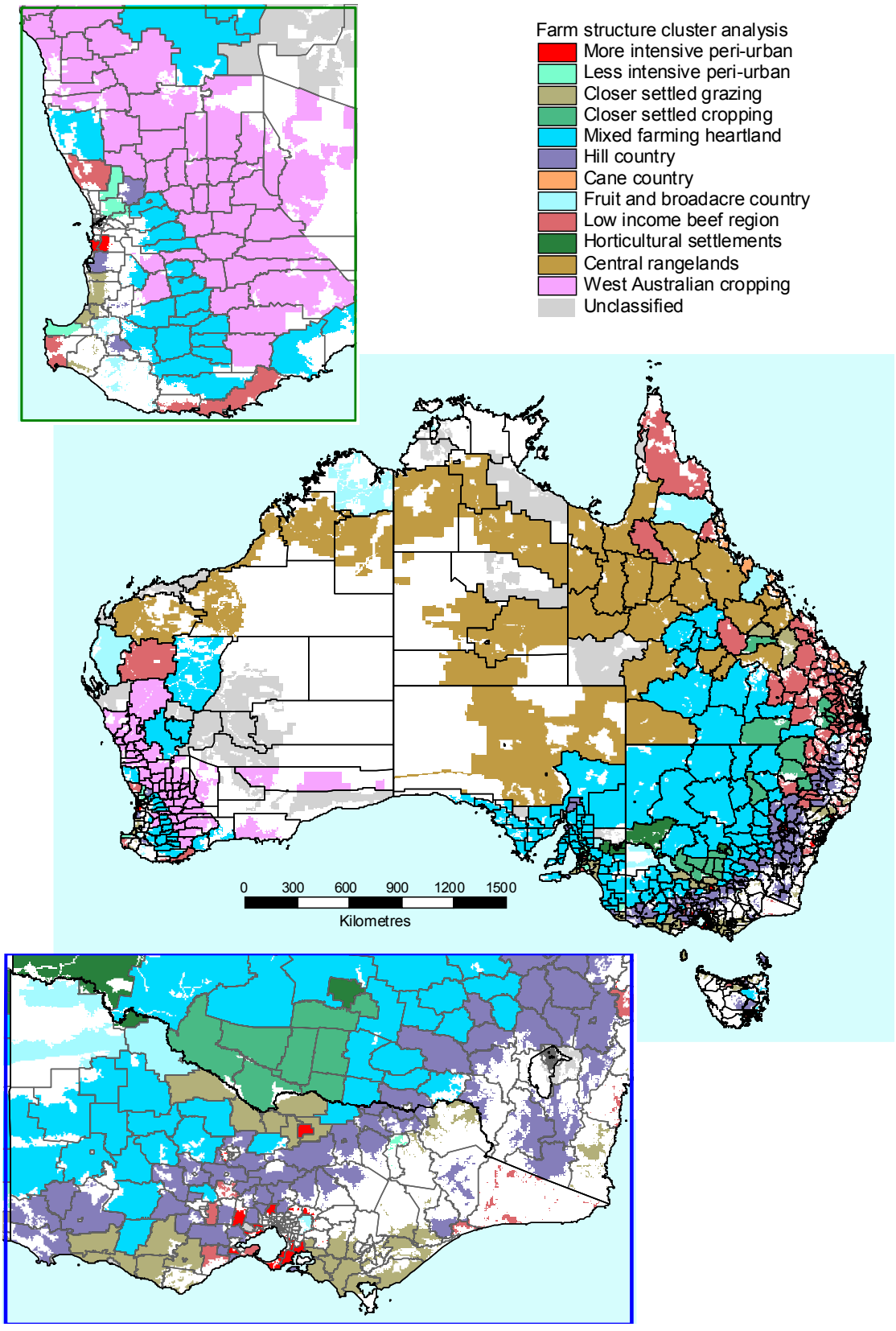
A1.2 AGRICULTURAL INDUSTRIES BY CLUSTER REGION (AVERAGED OVER SLAs WITHIN EACH CLUSTER)

	Establishments with industry as a % of all establishments in 1997										
Region	*Sheep*	*Wool*	*Beef*	*Dairy*	*Cereals*	*Grapes*	*Other Fruit*	*Vegetables*	*Rice*	*Cane*	*Cotton*
Peri-urban	13	12	27	8	8	4	18	23	–	–	–
Closer Settled Grazing	18	17	49	50	40	2	4	7	–	–	–
Southern Hill Country	67	66	68	6	33	2	3	3	–	–	–
Coastal Queensland	–	–	28	3	–	–	20	11	–	High	–
Northern Irrigated Cropping	27	25	60	5	76	1	1	1	–	–	22
Broadacre Heartland	35	33	39	2	73	2	1	2	–	–	–
Southern Irrigated Cropping	63	60	48	5	78	3	5	3	47	–	–
Irrigated Horticultural Settlements	18	17	9	2	16	63	39	6	2	–	–
Rangelands	19	19	90	–	5	1	1	2	–	–	–
Northern Beef	22	22	75	11	32	1	7	6	–	–	–
West Australian Cropping	38	37	17	–	94	–	–	–	–	–	–
Tropical Horticulture	6	6	20	1	6	3	64	35	–	Moderate	1

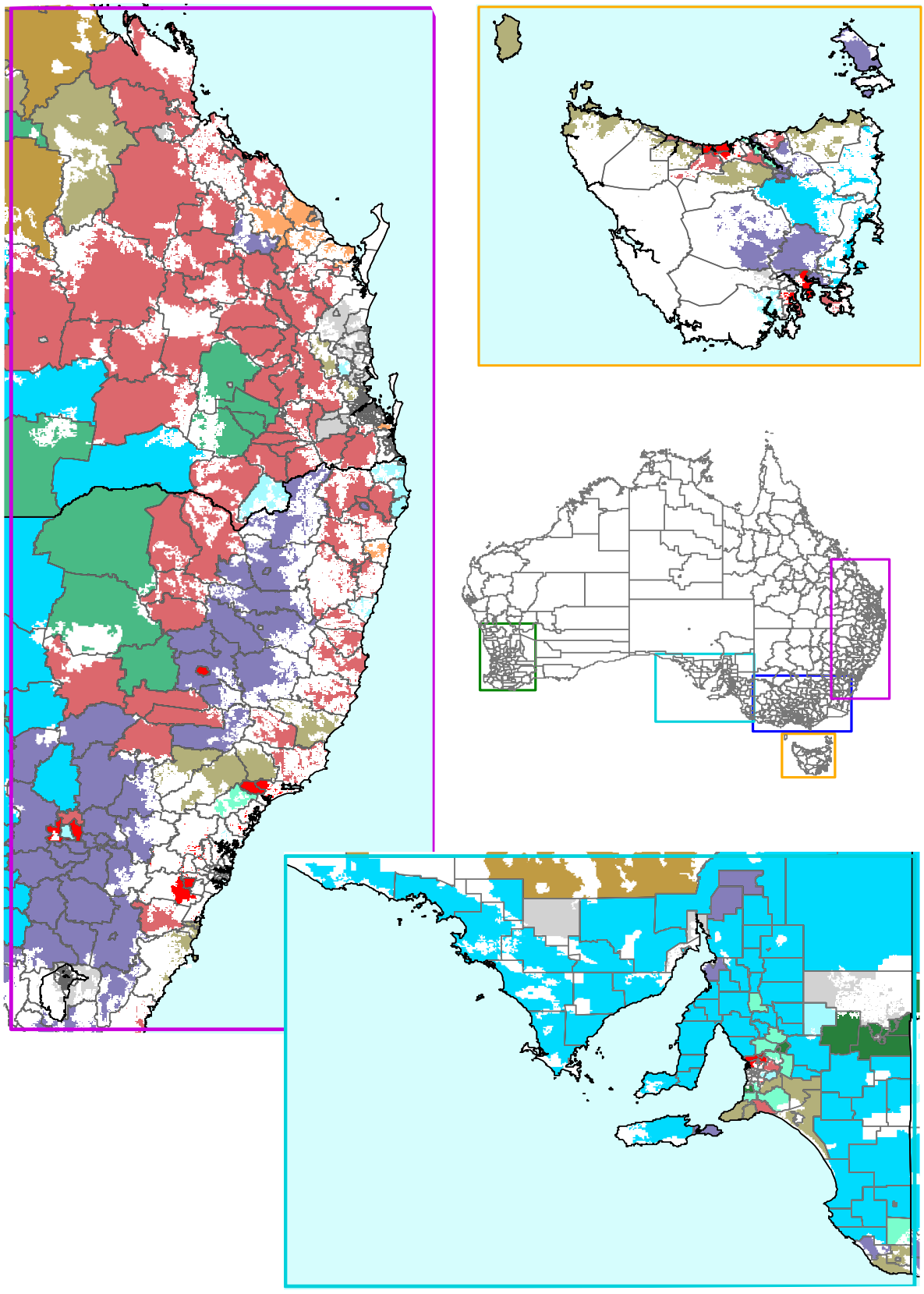
A1.3 SOME STRUCTURAL CHARACTERISTICS OF CLUSTER REGIONS AVERAGED OVER SLAs WITHIN EACH CLUSTER

	Peri-urban	*Closer Settled Grazing*	*Southern Hill Country*	*Coastal Qld*	*Northern Irrigated Cropping*	*Broadacre Heartlands*	*Southern Irrigated Cropping*	*Irrigated Horticultural Settlements*	*Range-lands*	*Northern Beef Zone*	*West Australian Cropping*	*Tropical Horticulture*
Ratio of establishment area to agricultural area 1996	50	93	100	100	100	93	100	87	100	100	82	91
% workforce with agriculture as main occupation 1996	4	14	13	9	19	27	27	12	10	20	33	9
Ratio of farm families to establishments in 1996	200	116	96	93	79	76	81	81	56	83	76	76
Median EVAO ($5,000 cut off) 1996 in 1996$	65	86	56	117	143	157	172	95	350	89	388	147
Establishments with EVAO <$32,000 as a % of establishments with EVAO above $32,000 in 1996	67	49	59	32	22	13	11	29	8	51	3	17
% Establishments with EVAO $32,000-$100,000 in 1996	45	36	57	33	31	28	22	45	11	44	8	24
% Establishments with EVAO $100,000-$300,000 in 1996	33	47	34	48	36	50	488	41	30	38	30	47
% Establishments with EVAO >$300,000 in 1996	22	16	9	20	33	21	30	14	58	17	62	29
% of farm establishment area held by establishments with EVAO >$300,000 in 1996	21	24	18	32	42	38	56	34	76	24	79	76
Median farmer age 1996	48	48	52	50	47	47	47	47	47	49	44	47
Average median farm family income 1986, 1991, 1996	40	36	34	37	32	29	31	37	38	28	35	42
Average % families with income <$20,000 1986, 1991, 1996	36	31	28	34	29	24	27	32	33	22	34	41
Average % families with income <$50,000 1986, 1991, 1996	17	22	24	21	29	31	32	21	23	34	25	17

A1.4 MAP OF AGRICULTURAL REGIONS DERIVED BY CLUSTER ANALYSIS OF SLAs (PART A)



A1.5 MAP OF AGRICULTURAL REGIONS DERIVED BY CLUSTER ANALYSIS OF SLAs (PART B)



APPENDIX 2 COMPARABILITY OF ESTABLISHMENT AND FARMER DATA FROM THE AUSTRALIAN POPULATION AND AGRICULTURAL CENSUSES .....

BACKGROUND

The economic and social structure of rural Australia has undergone constant restructuring since the introduction of European agriculture. Much of the adjustment has been driven by the pressures of terms of trade decline and misunderstanding of the nature of the Australian landscape (Barr & Cary 1992; Davidson 1981). Despite this history of constant change, there is a pervading sense of acceleration of change over the past few decades (Frost et al. 2002; Haslem McKenzie 1999). The impact of cultural and value changes in the wider Australian community and the growing spatial differentiation of wealth and income appears to have contributed to some rural communities feeling a sense of abandonment.

One policy response to this situation has been a number of studies that have attempted to use existing datasets to explore the state of rural and farm communities (Haberkorn et al. 1999; Lloyd, Harding & Greenwell 2001). This research revealed the heterogenous state of rural Australia, with some localities and sectors performing well and others showing clear disadvantage. A clear implication of the regional heterogeneity was the need for reliable small area data to effectively monitor and interpret the changing structure of rural Australia.

Few of the collections of the ABS are capable of providing reliable small area data due to the limitations of sample size. The exceptions are the Australian CPH and the AAC. These collections are currently administered on a concurrent 5-year cycle with the most recent census administration in 2001. The CPH captures basic demographic data based upon entities of the individual, the family and household (ABS 2001a). The AAC captures detailed information about Australian agriculture based upon the farm establishment entity. These two collections have the potential to provide researchers with a good understanding of the changing structure of Australian agriculture with reasonable geographic discrimination. Whilst these are both rich sources of data, there has been little attempt to integrate the two datasets to provide an improved understanding of the changing structure of rural Australia. One reason is the lack of a record level linkage between successive censuses and between the two datasets of the two censuses, such as is the case with national collections in Canada and Israel (Jackson-Smith 1999; Kimhi & Bollman 1999; Steeves 1979). This linkage provides researchers in these two countries with access to both time series panel data and demographic data linked to farm structure data. The potential to achieve such linkages in Australia is constrained

by both political culture and the statutory obligations placed upon the ABS by the *Census and Statistics Act, 1905*.

Data from both sources can be used to monitor change in the structure of Australian agricultural communities. It may be possible to develop useful indicators of structural change that utilise data from both collections after aggregation. To create meaningful social indicators using data from the two censuses, it is important to understand the relationship between the entities of enumeration in the two censuses. An initial exploration of these issues was undertaken for the National Land and Water Resources Audit using 1986, 1991 and 1996 data from both censuses (Barr 2001a). This study suggested there was some uncertainty over how farmers interpret their occupational status when filling in the Australian CPH form. This in turn creates uncertainty over the relationship between farm establishments, persons defined as farmers, farm families and farming households. These difficulties are increasing with the continuing trend towards increased use of off-farm work by farmers and increasing numbers of dual career farming households (Garnaut & Lim-Applegate 1998). Discussions with ABS staff have indicated that the regular workforce survey is an inappropriate vehicle for resolving these issues due to the small rate of sampling in rural areas.

To facilitate further exploration of these issues, a small number of demographic questions were included in the 2001 AAC. This paper uses these new questions to explore relationships between entities reported from the two censuses. Progress in our understanding of these relationships will allow researchers to build indicators that can be used to better understand and monitor changing social landscapes in rural Australia. It will also inform future discussion of the potential value of developing better coordination or linkage between the population and agricultural censuses.

ESTABLISHMENTS

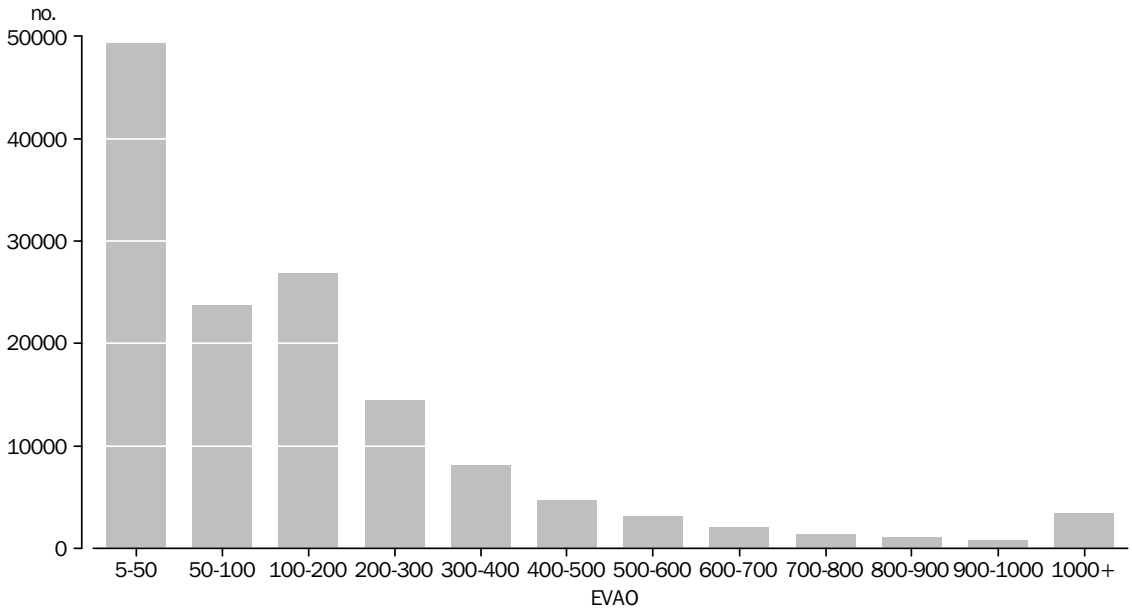
For the AAC the concept of an establishment is the same as that used by the ABS for all activity statistics collections. In the agricultural collection the establishment is the smallest accounting unit of business within an SLA, controlling its productive activities. In general an establishment covers 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.

The ABS uses production data to measure the relative size of agricultural activity of each establishment. The ABS developed this measure, the 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%, 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.

A2.1 FARM ESTABLISHMENTS BY EVAO

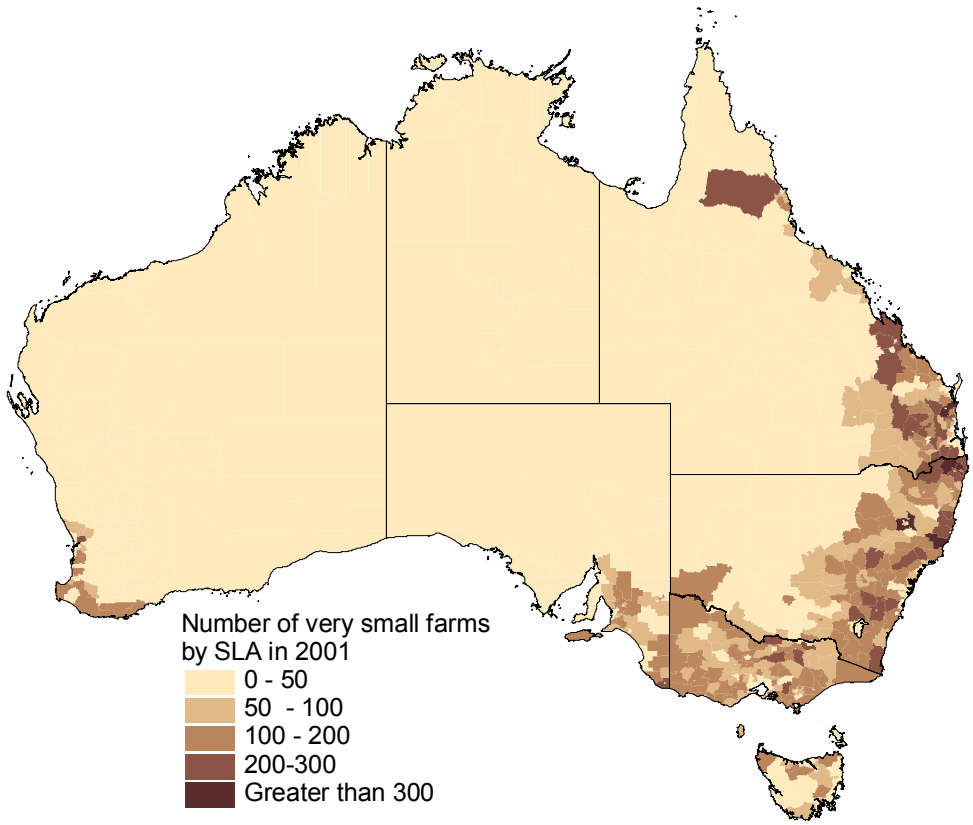


Source: Australian Agricultural Census, 2001

This distribution indicates great caution is needed in trying to compare establishment counts with the number of farmers or farm families. There is little likelihood of a farm with an EVAO of less than $50,000 being able to support an individual by providing their major occupation. One would expect many of these smaller farms to be managed by persons who support themselves in

another occupation. These small farms are predominantly found in coastal and high amenity locations (see figure A2.2).

A2.2 SLA BASED COUNT OF FARMS WITH EVAO LESS THAN $32,000 — 2001



FARMERS

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 and New Zealand Standard Classification of Occupations (ANZSCO). Persons whose main occupation is the management of a farm are classified to code 13 — Farmers and Farm Managers. Skilled agricultural workers including farm overseers are classified to code 46. Agricultural labourers are classified to code 992.

The total count of farmers and farm managers in 2001 was 194,883. 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.

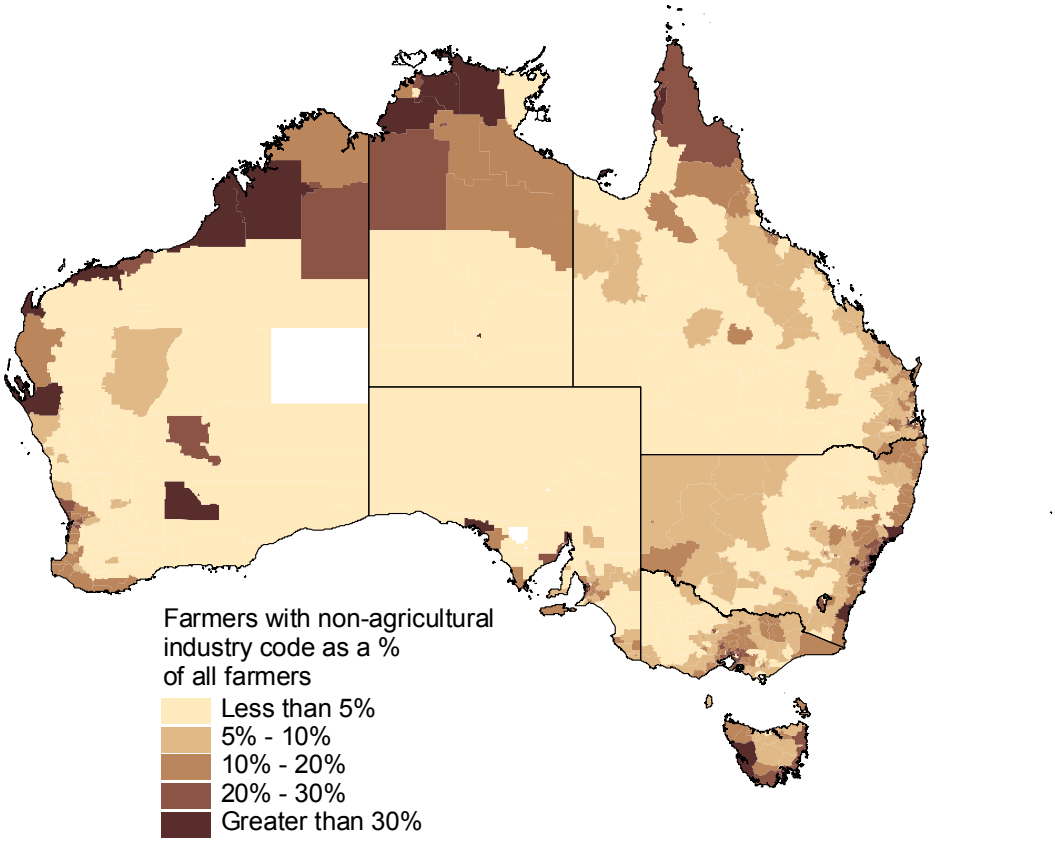
Evidence from mismatches between occupation and industry codes

Coders for the CPH do not check for consistency between codes for occupation and industry. Given the wording of the questions, one would expect that a person coded as a farmer or farm manager would generally be coded to an agricultural industry. Nine per cent of census respondents coded as farmers and farm managers (OCCP code 131) are coded with a non-agricultural industry code for question 35. It is very difficult to explain this mismatch as caused by the industry structures that lead some agricultural census establishments to be coded to a non-agricultural industry. This latter mismatch accounts for only 1.1% of establishments.

Another explanation is that farmers are answering questions 34 and 35 in isolation. In question 34 they may be referring to their main job with reference to the instructions in question 33 to nominate the occupation in which one usually works the most hours. In question 35 they may be choosing to describe the main activities undertaken in the last week without reference to the previously described main job. Other explanations may be found in the specificity of the activities described that lead to the allocation of a non-agricultural code, or to the desire of some respondents to make a statement about occupational self-identity in question 34.

Map A2.3 shows that the rate of mismatch is high in coastal and peri-urban locations and in the northern rangelands. The coastal and peri-urban mismatch is partly consistent with the spatial dispersion of smaller farm establishments. Here the mismatch may reflect off-farm work as a necessity on small farms. The high rate of mismatch in the tropical rangelands is not easily explained as farm sizes there are generally quite large.

A2.3 FARM FAMILIES CODED TO NON-AGRICULTURAL INDUSTRY CODE AS A PERCENTAGE OF ALL FARMERS



Source: 2001 Census of Population and Housing.

Evidence from 'method of travel to work' questions

Further evidence for the ambiguity in answers to question 34 can be seen in an examination of the commuting patterns of farmers on census morning. Question 41 asks:

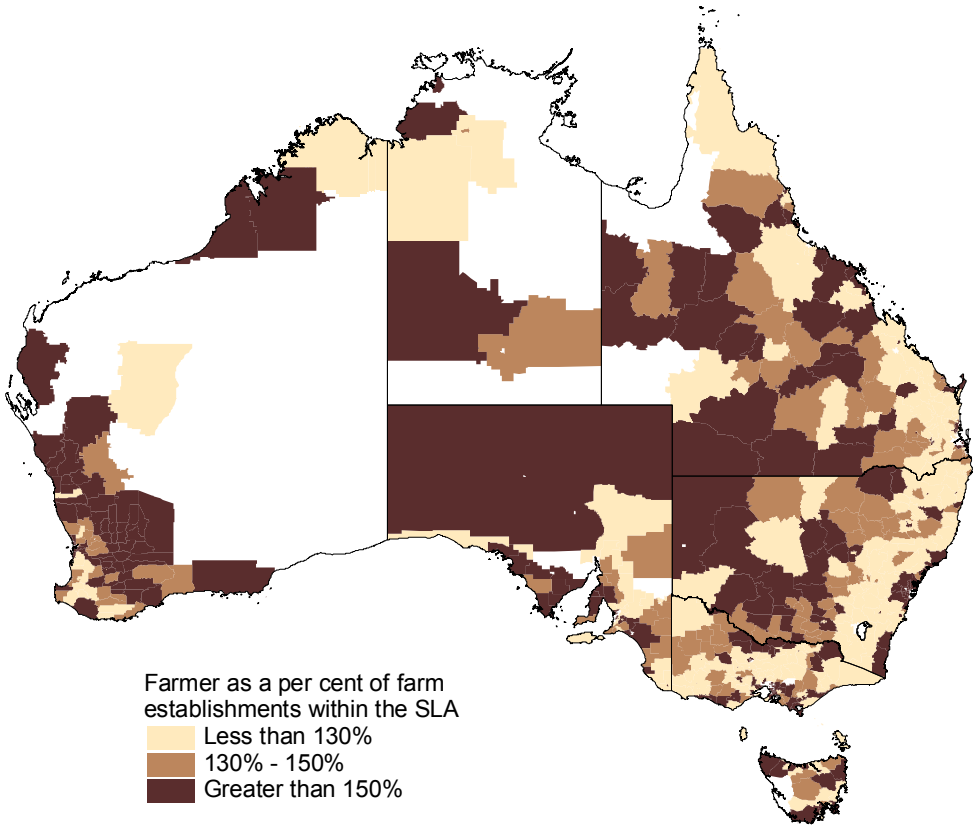
"How did this person get to work on Tuesday 7th August?"

Garnaut and Lim-Applegate (1998) estimated that in 1995, 9% of farm manager households in broadacre agriculture live away from the farm. One would expect that most farmers would indicate they worked from home. However, 33% of farmers indicated they commuted to work by car or similar means on census day. Farmers holding non-contiguous properties may be commuting to work. However, we hold suspicions that many of the commuting respondents are commuting to non-farm jobs, though they have described their main occupation as farming. If we assume the proportion of farmers residing off-farm has changed little in the intervening five years since Gaunaut and Lim-Applegate's estimate, then up to 24% of persons counted as farmers in the CPH may have been commuting to a non-farming job. Other sources indicate that between 30% and 40% of Australian farm families earn off-farm income

through salaries and wages (Australian Agribusiness Services 1997; Garnaut & Lim-Applegate 1998).

A map of commuting ratios reveals a more homogenous geographic dispersion than that of occupation and industry mismatch portrayed in map A2.3. If commuting were associated with larger farms composed of non-contiguous establishments, then one would expect the pattern of commuting to reflect the geographic distribution of farm size. Clearly intra-farm commuting and farm occupation pluri-activity are both contributing to the extent of farmer commuting.

A2.4 FARMERS COMMUTING TO WORK AS A PERCENTAGE OF ALL FARMERS WITHIN SLAs WITH GREATER THAN 30 FARMERS (2001)



Source: 2001 Census of Population and Housing.

Relationship between establishment and farmer counts

In 2001 the CPH counted 194,883 farmers and the AAC counted 138,917 agricultural establishments with an EVAO greater than $5,000. This is a ratio of 1.4 farmers per agricultural establishment. The higher number of farmers can in part be explained by the family based nature of farming, with many farms being managed by two spouses, or by two generations within the one family. Table A2.5 shows the relationship between farm families and farmers in Australian agriculture. Over one-third of farm families include more than one person who

describes farming as their main occupation. In the next two sections we examine the contribution of women and younger persons to the count of multiple farmer Australian farms.

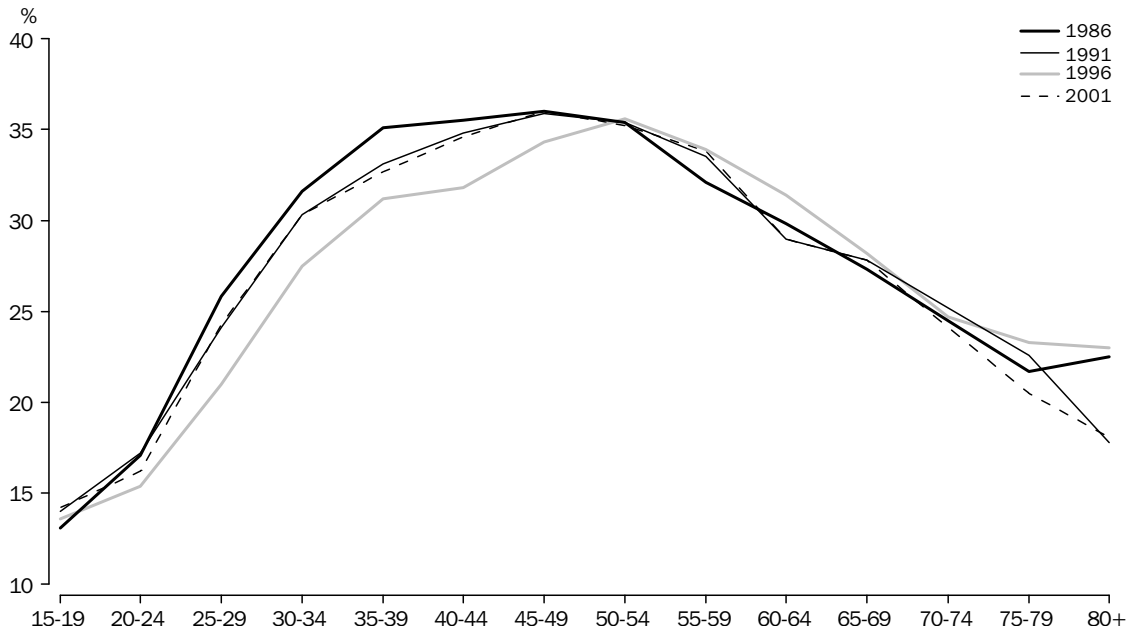
A2.5 NUMBER OF FARMERS IN AUSTRALIAN FARMING FAMILIES (2001)

Farmers in family	*Number of families*
1	88 902
2	46 900
3	3 194
4	412
5 or more	122
Total	**139 540**

The role of women within the Australian family business structure has not always been well recognised. Even as late as the 1970s a landmark study of the agricultural labour force of Victoria reported only the contribution of men to the farm workforce (McAllister & Walker 1980). The interpretation of the contribution of women to agriculture has undergone a social transformation with research identifying the proliferation of female roles within agriculture (Brandth 2002; Shortall 2002; Teather 1996).

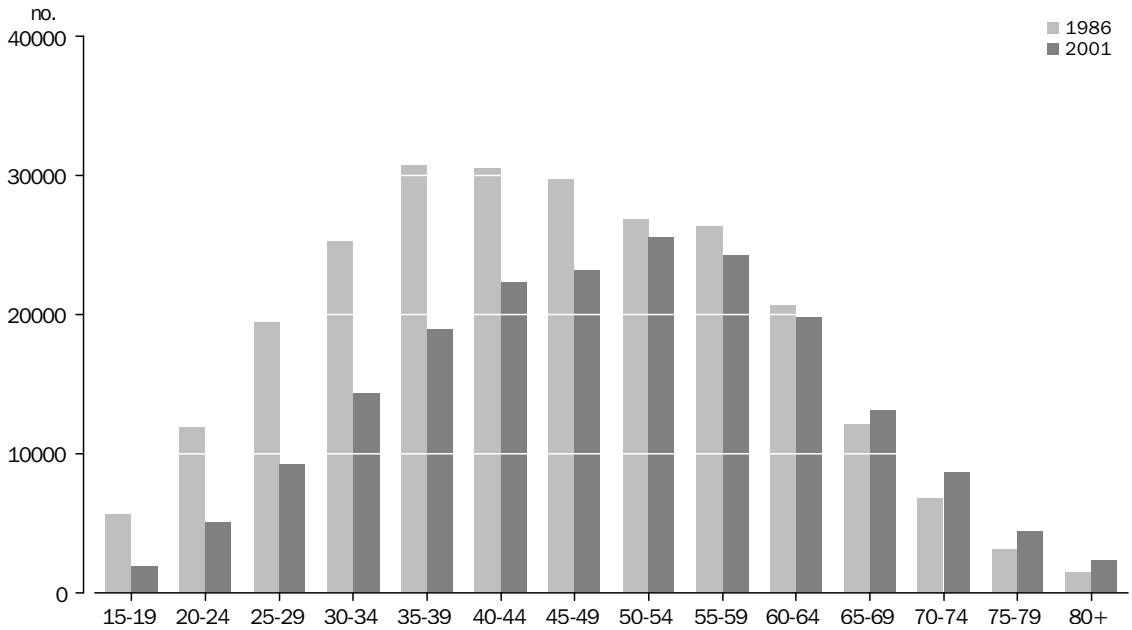
Behind this active reinterpretation of women's role in agriculture, the relative counts of women and men as farmers appear to have been quite stable over the past two decades. Graph A2.6 portrays the relative female composition of the farmer population by age cohort for censuses in the period 1986–2001. The pattern shows very little change over this period. Young farmers are predominantly male. The relative proportion of female farmers increases with age, reaching a broad peak at around age 45 years. Beyond 60 years, farming again becomes an increasingly male occupation. There is no clear evidence of differential behaviour in age cohorts. Changes in the female composition of the farming population appear to reflect a stable pattern of marriage into farming, active partnership in middle years and faster withdrawal from farming in older age.

A2.6 WOMEN FARMERS AS A PERCENTAGE OF TOTAL FARMER POPULATION WITHIN AGE COHORT



The extent of intergenerational sharing of farm management is difficult to determine. The CPH records farmers as young as the 15–19 year age cohort. It is almost certain these farmers are sharing farm management with a parent or other relative. Farmers younger than 30 years can generally be assumed to be jointly managing a family farm. It is difficult to conceive how a farmer younger than 30 years could accumulate sufficient capital to allow the purchase of a viable farm, though management as a salaried employee is more probable. It is clear that the sharing of farm management between generations is becoming less common as fewer young people choose to enter agriculture (graph A2.7).

A2.7 AUSTRALIAN FARMERS BY AGE COHORT IN 1986 AND 2001



FARM FAMILIES AND FARM HOUSEHOLDS

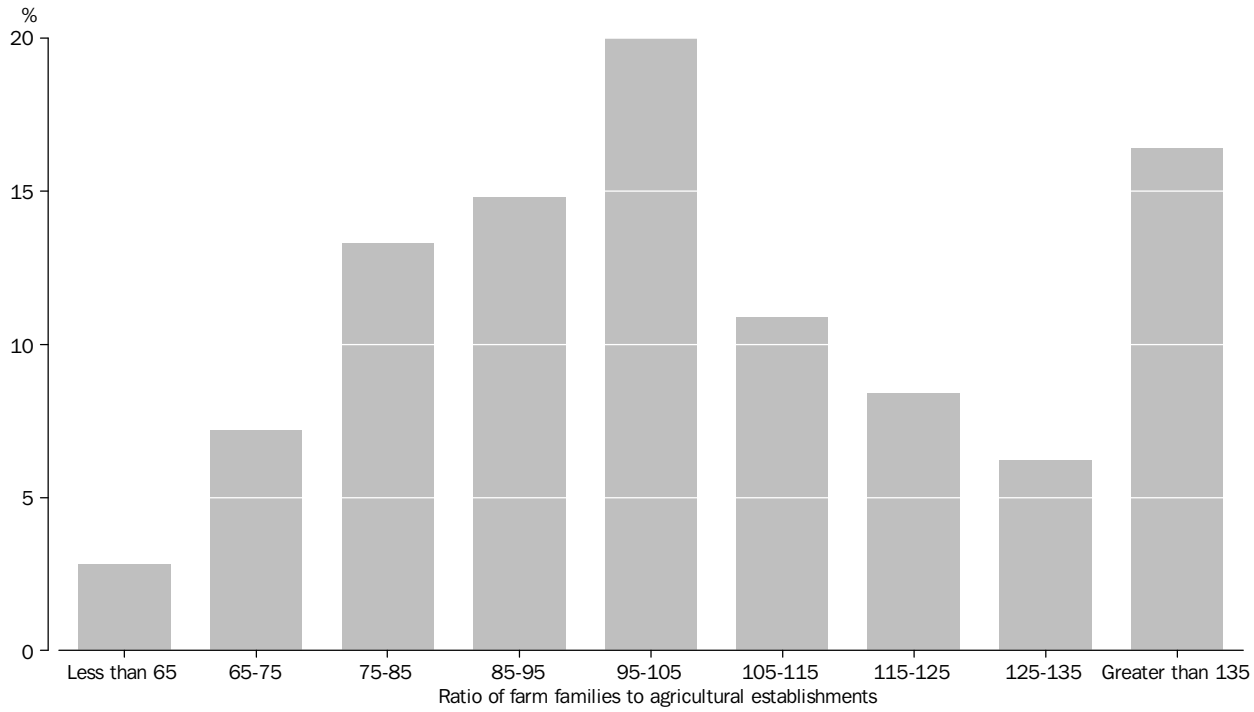
The previous section has demonstrated that there is no reason for us to expect a close match between the count of farmers and the count of agricultural establishments. In this section we explore whether the count of farm families can provide a better match with the number of farm establishments.

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 his or her main occupation as farming.

The ABS defines a household 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.

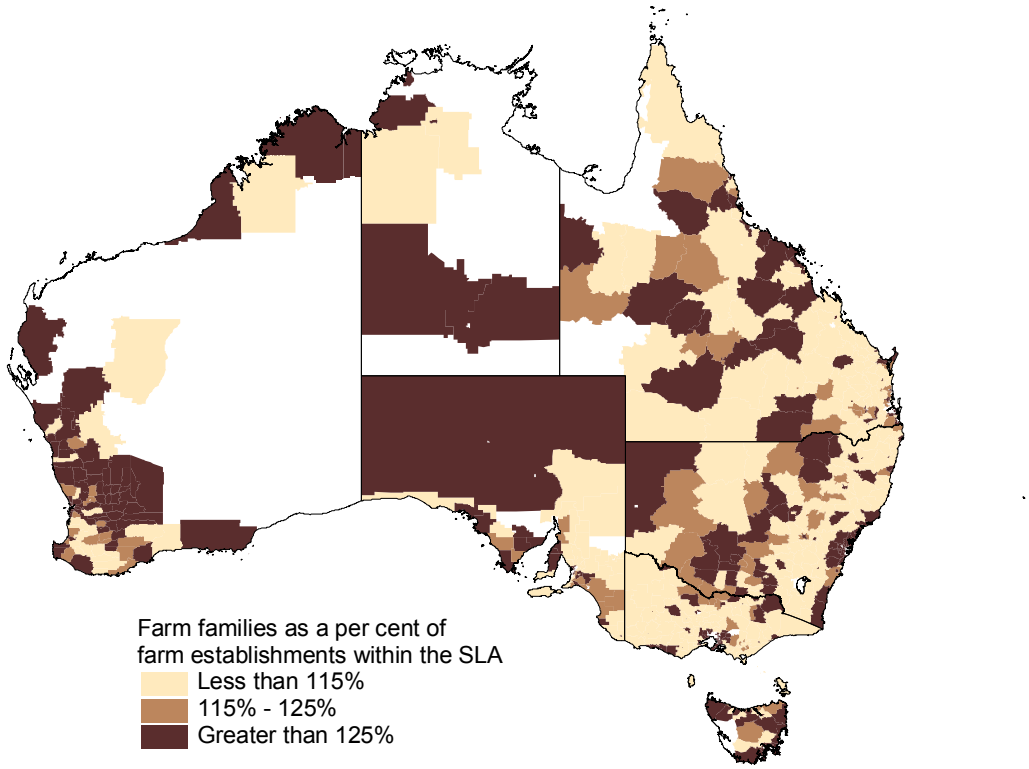
In practice, the choice of whether to use farm household or farm family data is of limited importance. Households of unrelated individuals that include one farmer are quite uncommon. In 2001 the ABS CPH counted 139,530 farm families and 138,710 farm households, a variation of only 0.6%. There is also a very close match with the 138,917 establishments with an agricultural industry coding. Despite this very close match, there is significant geographic variation in this relationship. The ratio is higher in four general areas: peri-urban regions, irrigation districts, parts of the rangelands and coastal New South Wales (see map A2.9). Different factors may be at work in each of these regions. In irrigation districts there are a higher than average proportion of large farm businesses (dairy, cotton) capable of supporting more than one family. The rangeland also tends to have a higher than average number of larger businesses. The high count in coastal New South Wales is harder to explain. The majority of farms in the coastal zone are generally small and one would not expect many to be capable of supporting multiple households. One potential explanation is undercounting of establishments in the AAC. These may be small properties that are managed by retired persons whose main income source is investments and superannuation. Further field work would be needed to better explore this situation. Low ratios are generally found along the Great Dividing Range where the predominant land use is wool or beef production, where there are many small farms and where off-farm work is common.

A2.8 AGRICULTURAL FAMILY COUNT AS A PERCENTAGE OF FARM ESTABLISHMENTS WITHIN EACH SLA



Source: 2001 Census of Population and Housing, 2001 Australian Agricultural Census

A2.9 FARM FAMILIES AS A PERCENTAGE OF AGRICULTURAL ESTABLISHMENTS BY SLA WITH GREATER THAN 30 FARMERS (2001)



Other than the areas discussed above, there is a relatively close correspondence between family and establishment counts. If we limit our examination to SLAs with greater than 50 farm families, 45% of SLAs have a farm family to establishment ratio that falls within the range of 85% to 115%.

Despite the apparently close match, we need to be cautious about this result. This close correspondence is based upon an establishment count that includes establishments with EVAOs as small as $5,000. Many smaller establishments within this count would not be expected to provide a person's main occupation. In the next section we explore the relationship between major occupation and establishment EVAO.

NEW INFORMATION ON THE OCCUPATIONAL STATUS OF ESTABLISHMENT OPERATORS

In 2001 the ABS introduced a small number of demographic questions to the AAC. One of these was an attempt to determine the occupational status of establishment managers. Question 30b asked:

> "Is the operation of this holding the main occupation of the person who manages or operates this holding?"

The wording of this question was chosen to allow comparison with the occupational question on the CPH. It was not possible to use the exact words of the CPH question that asks for the "main occupation *this week*". There is no single week in which the AAC is completed. Completion may take place over a number of weeks and these weeks may fall any time within a window that may approach six months in length. The question also assumes that there is one person who manages or operates this holding. This assumption is reasonable for small holdings with a minimal EVAO. The purpose of the question is to identify holdings on which there is no person whose main occupation is farm management. These will generally be small holdings.

The question elicited a response rate of 88%. Non-responses were clearly higher from establishments with small EVAOs. The non-response rate from establishments with an EVAO less than $50,000 was 17%. The responses to question 30b reveal a very strong relationship between farm EVAO and occupational status of the operator of the establishment (see graph A2.10). In total, 23,570 establishments had an operator whose main occupation was not operating the establishment (see graph A2.11). The great majority of these establishments will be associated with households in which no member would have described farming as their main occupation in the CPH. These establishments should not be included in any comparison of establishment counts and farm family counts.

A new indicator was created to assess comparability of farm establishment and farmer population data. Establishments were included if they met the following criteria:

- The establishment was coded to an agricultural industry rather than a non-agricultural industry. This reduced the count from 140,516 to 138,917 establishments.
- The operator indicated his main occupation was managing the farm (98,540 establishments). This count was increased by a pro rata allocation of establishments for which there was no response to the occupational question (raising the establishment count to 111,031). Pro rata allocations of non-responses were undertaken separately for 24 EVAO ranges across the full distribution because of the strong relationship between EVAO and non-response rates.

Farm households were chosen as the closest measure to farm establishments. Households that contain more than one family are very unlikely to be associated with more than one farm establishment.

- Removing those households where the farmer in the household was coded to a non-agricultural industry reduced the farm household count. This decision is based upon an assumption that non-agricultural industry coding indicates the farmer is working in another occupation and there is a high probability this is his or her main occupation. This created a farm household count of 128,316.
- This household count was inflated by the multiple counting of farm households with more than one farmer associated with differing agricultural industries. The national extent of this over-counting was 0.95%. The count of households was reduced by 0.95% to give a final count of 124,222 households.

After making these adjustments, the disparity between the establishment counts and farm household counts increases to 1.12 farm households for every farm establishment providing a major occupation for a manager. A similar estimate for farm families produces a slightly higher ratio of 1.125. These differences are quite small and can be easily explained by farm establishments with more than one farm household or family. Garnaut and Lim-Applegate (1988) estimated that the average broadacre farm business was associated with 1.7 households. This estimate is not closely comparable as it excludes establishments with less than $22,500 EVAO and includes households with farm workers as well as relatives of the owner manager and business partners. If we adopt the $22,500 EVAO for our own calculations, the ratio is increased to 1.3. However, there is no means of resolving the differing household definitions. One can only conclude that the relationship between farm households where farming is the major occupation and farm households is a moderately one to many relationship and this is consistent with the limited data from other sources.

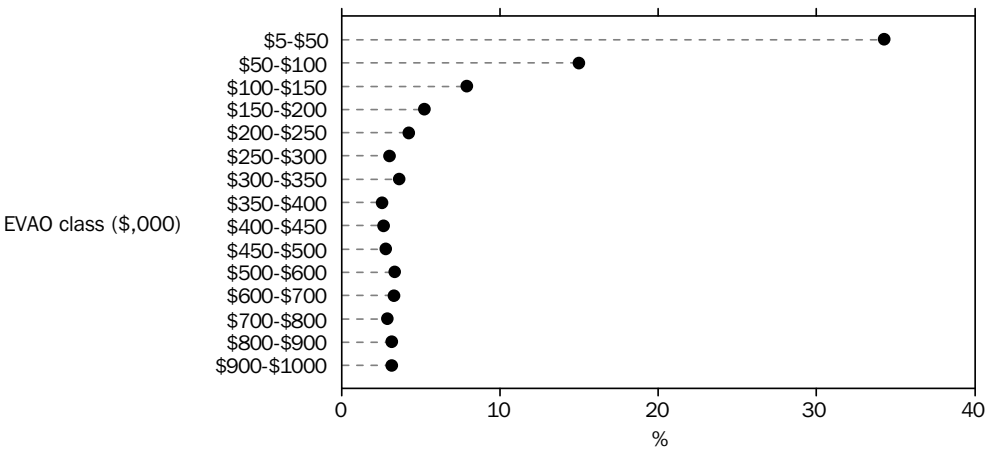
The apparent consistency between establishment and household counts at a national level breaks down a little when one examines the relationship at SLA geography. Map A2.12 portrays the ratio for SLAs with more than 30 farmers in

2001. SLAs with smaller farmer counts are excluded to reduce exaggerated variation caused by small ratio denomination values. It is clear from the map that the geographic variation is not purely random. There are four clear aggregations of SLAs with higher than average ratios. These are the northern wheat belt of southwest Australia, irrigated cotton cropping districts in New South Wales and Queensland, Peri-urban districts and coastal areas of New South Wales.

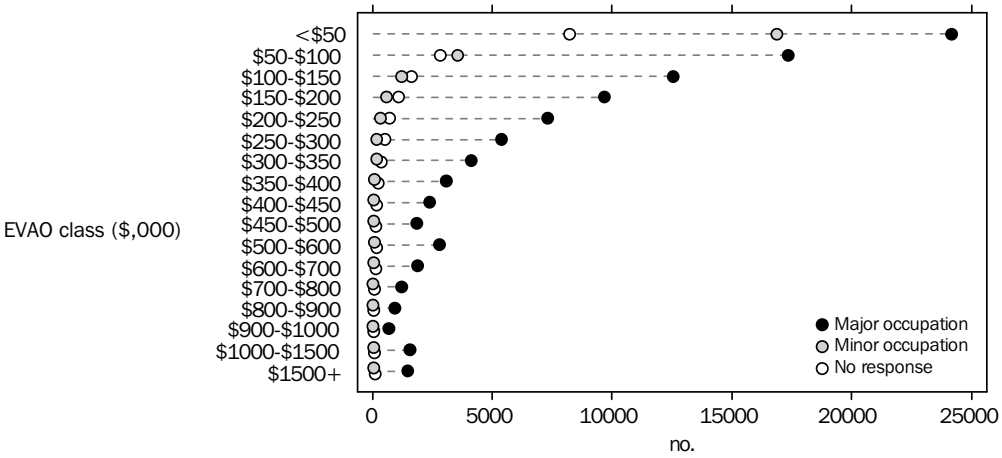
The regional differences are made clearer in graph A2.13. This displays the ratios for a number of regions of Australia. These regions were created using a clustering of industry and structural data. The full process is described elsewhere (Barr 2001a). The highest ratios are found in the Peri-urban region. There has been recent discussion of the potential under-enumeration of agricultural establishments in the Peri-urban area (Houston 2003). West Australian Cropping and Northern Irrigated Cropping regions have the next highest ratios. These districts both have a high proportion of large farms, and it is a reasonable contention that many of these establishments are supporting more than one related family household.

The three regions with the lowest ratios are Irrigated Horticultural Settlements, Northern Beef and Southern Hill Country. Each of these regions is characterised by an above average number of small farms. The Irrigated Horticultural Settlement region comprises the horticultural irrigation districts along the mid and lower Murray River. These settlements were developed in the first part of the last century and have many smaller 'blocks' which are now farmed part time. The Northern Beef Zone includes many SLAs in the higher rainfall beef-producing region of southeast and central east Queensland. This region again has many small farm establishments. The Southern Hill Country includes many SLAs along the southern Great Dividing Range where sheep and beef production are the predominant enterprises. Land values are high in comparison to agricultural potential and this has inhibited farm aggregation (Barr & Karunaratne 2002). There are many small establishments and part-time farmers.

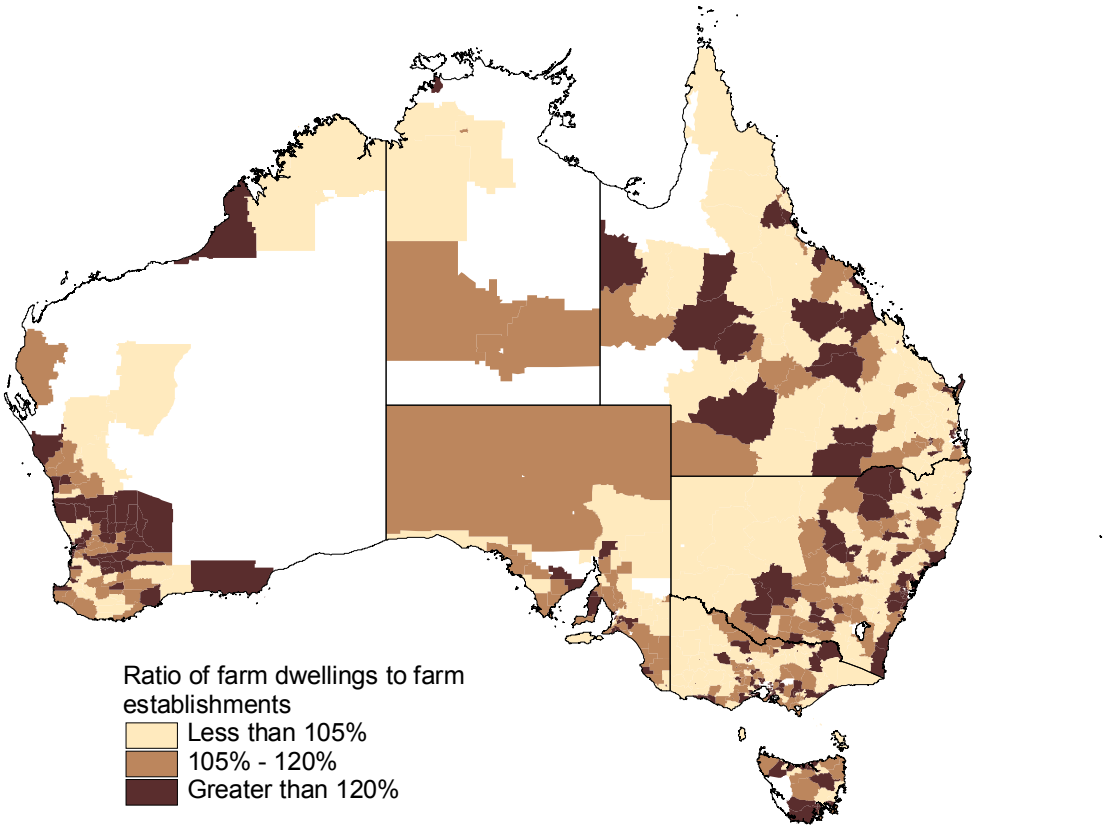
A2.10 AGRICULTURAL ESTABLISHMENTS WITH OPERATOR NOT NOMINATING OPERATION OF ESTABLISHMENT AS A PERCENTAGE OF ALL ESTABLISHMENTS WITHIN EVAO CLASS



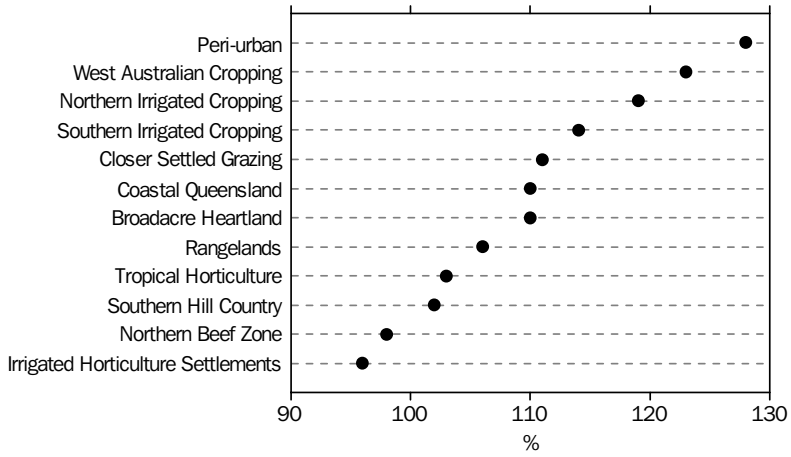
A2.11 NUMBER OF AGRICULTURAL ESTABLISHMENTS BY EVAO AND OCCUPATIONAL STATUS (2001)



A2.12 FARM HOUSEHOLDS CODED TO AN AGRICULTURAL INDUSTRY AS A PERCENTAGE OF ESTABLISHMENTS ON WHICH OPERATOR NOMINATES FARMING AS MAIN OCCUPATION BY SLA WITH GREATER THAN 30 FARMERS (2001)



A2.13 FARM HOUSEHOLDS AS A PERCENTAGE OF ESTABLISHMENTS ON WHICH OPERATOR NOMINATES FARMING AS MAIN OCCUPATION BY REGION (2001)



CONCLUSIONS

The use of a low EVAO cut-off in the AAC means the count of farm establishments includes a large number of small farms that are incapable of supporting a family without significant off-farm income generation. The lack of indexation of the current cut-off and the increasing polarisation of farm structure in Australia will ensure that the preponderance of small farms in the AAC count will increase with time.

The introduction of an occupational status question on the AAC has produced a valuable insight into the status of part-time farming within this small farm sector and allowed more meaningful comparisons between data in that collection and farmer data contained in the CPH.

Comparisons between establishment counts in the AAC and farmer counts in the CPH are made difficult by the potential ambiguity of farmers' responses to main job and occupation questions. Ten percent of individuals coded as farmers for the census occupational variable are coded to an industry other than agriculture in the industry variable.

If one constrains comparisons to establishments managed by someone whose main occupation is a farmer, and to farm households in which farmers are coded to agriculture as their industry of employment, then in aggregate there is a relatively close relationship between the count of farm establishments. However, this close relationship is based on a count that includes a large number of establishments generating very little production and which would be generally considered incapable of supporting a household or individual.

This aggregate correspondence is not geographically homogenous. The relationship between farm establishments and farm households is one to many. In regions with a greater proportion of large farm establishments the ratio between farm households and farm establishments is generally higher than the national average. However, it is also high in peri-urban and amenity coastal locations where there is generally a larger proportion of small farms.

The definitional difficulties encountered in this exercise lead us to conclude that the use of aggregated data from the two censuses to create hybrid social indicators to describe farm communities will be a strategy of limited usefulness. It will not replace the richness of analysis that might be gained from linking the two collections as in Canada or Israel. Some progress in the development of hybrid indicators might be made if the uncertainties over the relationship between the various enumeration entities could be clarified.

A PROPOSAL FOR A CHANGE TO THE CPH HOUSEHOLD FORM:

The following proposal would significantly reduce the uncertainties discussed above. It would address two issues of concern with the current CPH Household Form:

- inaccurate counting of persons whose main occupation is agriculture
- no attempt to count persons who may operate a significant agricultural business, but who also work a greater number of hours in an off-farm occupation.

Our preferred option is to see a generic solution that is applicable to all persons with dual occupations. This would provide useful output about multiple occupations and job holding in all industries, not just agriculture. We believe the following steps might achieve this:

- tighten the instructions in the main form that define 'main job' in question 33
- ask if the person held a second job
- ask for the occupation of the major job and the secondary job.

In the case of agriculture, we believe that giving farmers the opportunity to identify a second occupation as farming may well improve the quality of data collected on major occupation. It will allow those for whom farming is a secondary occupation to assert publicly their personal identity as a farmer without compromising the quality of data collected on major occupation.

A less generic solution would be to ask a question targeted only at farming. This might ask "Were you responsible for managing a farm last week?" Although this is the simplest option, its usefulness is limited to agriculture.

We see the following outcomes for the proposed question changes:

- improvement in the quality of major occupation data collected about farmers, and potentially other occupations in which there is a strong self-identification
- improved quality of data on the characteristics of land managers in peri-urban, amenity farming, horticultural districts and regions in which farm industries are experiencing poor returns

- enhanced capacity to estimate rates of entry to and exit from farming and improved capacity to model future demographic structures of farm communities through better tracking of movement between farming as a major or secondary occupation
- greater capacity to compare small area data derived from the AAC and the Australian CPH, providing the capacity to build more reliable synthetic indicators based of these two data sources.

Uses of this information would be in:

- catchment planning and natural resource management policy projects that need improved social profiling and social impact assessment work
- farm welfare analysis associated with drought, natural disaster and industry restructuring policy
- strategic planning for rural and peri-urban municipalities.

The main output will be two new variables:

- number of occupations (none, one, more than one)
- secondary occupation, based upon Australian and New Zealand Standard Classification of Occupations (ANZSCO). It might be possible only to code this to the two-digit level and still gain most of the benefit.

The main cross-tabulations to be derived from this new information would be:

- a number of community profile standard tables of age, sex, income and education could be repeated using a break down of farmers according to minor and major occupational status
- major occupation by minor occupation
- tables based upon farm household (household with one member indicating a farming occupation) by major and minor occupation structure of household members
- for larger area analysis of entry, exit and population modelling, farmer occupational status (major or minor) by industry, by age, by sex, by five year migration indicator by five year household mobility indicator
- for small area estimates of entry, exit and population modelling, farmer occupational status (major or minor) by age, by five year migration indicator
- for comparability of data from the AAC and CPH: tables based upon farm household (household with at least one member indicating a farming occupation) by major and minor occupation structure of household members.

There is an ongoing requirement for this information for policy development and planning as governments respond to the increasing pressure for the greater protection of environmental values associated with rural land and water. This

data will be crucial for future socioeconomic impact assessments associated with issues such as increased environmental flows or land use change. Analysis for natural resource issues requires customised regions built from the smallest area data possible.

Data of this nature is not available from other sources. The closest alternative is the ABARE farm survey. However, sample rates from the survey are low and there is no information on migration. Given the dispersed nature of the users of the products built from this data (e.g. many catchment management authorities, industry bodies, and state government departments) it is unlikely that any one user or small group of users would fund alternate methods of collecting this data. This will mean that social assessments will be based upon less than adequate descriptions of the farm sector.

Failure to resolve the problems we have discussed will reduce the value that might be obtained by allowing greater linkage between the CPH and the AAC. While the most value would be obtained by unit record linkage as is the case in Canada and Israel, aggregated linkage at the small area level still holds promise for the construction of synthetic indicators. The benefits we have discussed have focused upon the rural and farm industry context. We do not feel we are in a position to discuss the benefits of better data on multiple job holding amongst the wider community.

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