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# Demographic modelling of Australia's sheep farmer population

# Summary

This report outlines the changing demographic structure of the Australian sheep industry during the years 1976 to 2001 and projects likely demographic trends as far as 2031. The sheep industry includes both woolgrowing and lamb-sheepmeat. It is almost impossible to analyse the demographic changes in the two industries separately, partly because the two commodities are usually produced together, but mainly because it is impossible to obtain demographic data for the two industries separately. The analysis presented in this report is based upon 'custom tables' produced by the Australian Bureau of Statistics (ABS) and purchased specifically for this project.

The number of sheep farmers in Australia has reduced by more than half from 1976 to 2001. This decline in numbers has not been uniform across the period, with the sharpest falls over the periods 1976–1981 and 1986–1991. The decline in numbers has been most pronounced among the younger age groups.

The exit rate from sheep farming has been falling since its retirement-driven peak in 1986–91, during the period of relatively high wool prices. The fact that exit rates from sheep farming have fluctuated while exit rates from all Australian farming have remained relatively stable suggests that much of the fluctuation can be attributed to movement from sheep farming into other farming industries rather than out of farming completely.

In contrast to the exit rate, the rate of entry to sheep farming has remained relatively constant. What has changed about entry to sheep farming has been the median age of entrants. The substantial drop in the number of young sheep farmers has been driven by a large reduction in the number of young people entering sheep farming, particularly those aged under 35. There are now two age-related peaks for entry into sheep farming: 35–40 and 55–59. The new entry profile reflects in part a lifestyle choice by men wishing to change careers later in life, perhaps returning to the family farm as their parents age.

One consequence of these trends is that the median age of entrants to sheep farming, relatively constant from 1976 to 1991 at between 33 and 35 years, has increased by over 7 years to 43 years in the 10-year period from 1991 to 2001. This has in turn driven up the median age of all sheep farmers over the same period. The areas where the sheep farmers have the highest median age are mostly in the high amenity, high rainfall country between Melbourne and Sydney, where farms tend to be smaller than average.

All these trends are projected to continue. Future demographic change is projected to continue at a rate similar to that of the past, with the rate of change eventually slowing, leading to a stable demographic structure of fewer but on average older sheep farmers in about 2021, when the number of sheep farmers will have roughly halved and their median age will have increased by about 6 years.

Behind the projected increase in the median age of sheep and sheep-beef farmers lie two phenomena: one concerning the very young, the other the very old. First is the almost complete disappearance from the industry of those younger than 30. Second is the explosion in the number of farmers aged 80 and over, as they become the most populous age cohort of all.

The baby boomers, born between 1946 and 1950, are an important factor in sheep farmer demographics. Since 1986, through almost all of their working life, they have formed the most populous 5-year age cohort. In 2021 they will be aged between 70 and 74, an age at which many current farmers are still working hard, actively managing their farms. While many lifetime commercial farmers in this cohort may well have retired by then, many of those who had retired to sheep farming may not be ready to leave their farms.

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## Abbreviations

| | |
|---|---|
| AAC | Australian Agricultural Census |
| ABARE | Australian Bureau of Agricultural and Resource Economics |
| ABS | Australian Bureau of Statistics |
| CPH | Census of Population and Housing |
| EVAO | Estimated Value of Agricultural Operations |
| LGA | Local Government Area |
| SLA | Statistical Local Area |
| SSD | Statistical Subdivision |

# 1 Introduction

## 1.1 Purpose of this report

This report outlines the changing demographic structure of the Australian sheep producing industry during the years 1976 to 2001. This includes both the woolgrowing industry and the lamb and sheepmeat industry. It is almost impossible to analyse the demographic changes in the two industries separately. This is partly because it is impossible to produce one of these commodities without producing the other as a by-product or even a co-product, but mainly because it is impossible to obtain demographic data for the two industries separately.

During this period the sheep industry achieved little productivity growth, less than that of other broadacre agricultural industries (Knopke *et al.* 2000). The wool industry experienced major fluctuations in prices and the transition from a regime of price support to a more open market structure. The sheepmeat industry also experienced price fluctuations, but not the major market changes of the wool industry. This report explores the impact of these industry changes on the social and demographic structure of the Australian sheep industry. It also seeks to provide some demographic explanations for the low productivity gains of the industry and the limited structural adjustments to price signals within the industry.

The report goes on to project likely demographic trends among Australia's sheep farmers as far as 2031, based on current trends.

## 1.2 Data sources

The analysis presented in this report is based upon national collections by the Australian Bureau of Statistics (ABS). Standard tabular information published by the ABS normally provides little detail of industries such as the sheep industry. This research has been based upon 'custom tables' produced by the ABS specifically for this project. I have used data from two ABS sources as well as other data.

**Census of Population and Housing (CPH)**: The Census of Population and Housing is conducted Australia-wide by ABS at five-yearly intervals, the most recent being in 2001. This report utilises data from the 2001, 1996, 1991, 1986, 1981 and 1976 censuses. These censuses provide information about individuals who describe themselves as farmers, and about their families.

**Australian Agricultural Census (AAC)**: The ABS conducts a census of Australian agricultural businesses or 'establishments'. Until 1997, this census was conducted annually. Another census was conducted in 2001. The focus of the AAC is on production information. It is not possible to link AAC data for an establishment with corresponding CPH data for the household, family or individual that manages or works on that establishment. Thus, data from each of the two censuses are presented separately in this report.

**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).

## 1.3 Data processing

Data from the ABS is not made available in a manner that enables the identification of individuals or single families. It is normally published in aggregated format. Much of the data presented here has been processed at national level. Where there is significant geographic variation, maps have been produced to display this variance. These maps have been based on customised regions developed in consultation with sheep industry contacts. These customised regions separate Australia broadly into pastoral, wheat-sheep and high rainfall areas, and those major regions are subdivided further based on patterns of sheep production. The custom regions were created by aggregating data for Statistical Local Areas (SLAs). SLAs are geographic regions used by the ABS to report summarised aggregate data. They are based upon Local Government Areas (LGAs), with one Local Government Area encompassing from one to five or more SLAs. Statistical Subdivisions (SSDs) are also mentioned in this report: they generally wholly encompass

two or more SLAs. SLA and SSD boundaries change in response to changing population distribution and changing administrative boundaries.

Major changes in Victorian LGA boundaries in the past decade have caused major changes to Victorian SLA boundaries. Changes in other states have been much less dramatic. All spatial analysis conducted for this project has used 2001 SLA 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 at an SLA level is best undertaken with usual residence data. The ABS is able to provide enumerated data for past censuses aggregated to 2001 geography. It is unable to do this for usual residence data. Where data are reported for custom regions made up of many SLAs, or for the whole country, as in this project, the benefit of using usual residence data is reduced, because there is less difference between usual residence and enumeration data. The proportion of people who are in a different region on census night is very small. I have used enumeration data in this project.

Data for specific establishments gathered by the AAC cannot be matched with data for specific individuals gathered by the CPH. In part this is because the relationship between individuals and establishments is complex: although the number of farmers is similar to the number of establishments, there may also be one-to-many and many-to-one relationships. Another reason is the possibility of identifying individuals, something that ABS goes to great lengths to prevent.

## 1.4 Counting sheep producers in the ABS Population Census

The ABS Census of Population and Housing provides data about the occupation and industry of Australians. Occupational coding is based upon answers to questions 32 to 35 in the census form (question numbers from 2001 CPH). 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?"

The 'main job' is defined in the form as the job in which the person usually works the most hours. This definition appears to be interpreted with some flexibility by farmers. It appears that at least 10 per cent and possibly as many as 20 per cent of persons coded as farmers allocated the majority of their working hours to a non-farm job in the week prior to the 2001 census (Barr 2004).

Industry coding is based upon questions 38 and 39. Question 39 asked:

> "What are the main goods produced or main services provided by the employer's business?
>
> Describe as fully as possible, using two words or more
>
> For example: wheat-sheep, bus charter, health insurance, primary school education, civil engineering consultancy service, house building, steel pipes.

The word 'sheep' receives a prominent mention, but there is no hint that it might be split into wool and meat.

Industries are coded using the Australian and New Zealand Standard Industrial Classification (ANZSIC). ANZSIC has no industry code for wool or sheepmeat production, only a number of codes that include sheep farming:

- 0122 Grain-sheep and grain-beef farming
- 0123 Sheep-beef farming

- 0124 Sheep farming

The census category of 'Sheep farming' means sheep only, and not sheep in combination with other industries such as cropping or beef. Most specialist sheep producers are likely to be woolgrowers, for several reasons. First, 86% of the national adult sheep flock is made up of merino sheep (Curtis and Croker 2005). Second, most lamb and sheep-meat production is a by-product of (or co-product with) other types of farming, rather than a specialist enterprise. In 2001–01 only 15% of farms in Australia that produced some prime lambs received more than 30% of their income from prime lambs (Connell *et al.* 2002), p. 12). Third, despite anecdotal evidence of increasing numbers of merino ewes being joined to meat breed rams, in the 2004–05 joining season 73% of merino ewes were joined to merino rams nationally, a figure probably just sufficient to maintain a self-replacing merino ewe flock (Curtis and Croker 2005). However, a lot of grazing country that can be used to run sheep can also be used to run beef cattle. It is easy enough to move between running sheep only and running both sheep and beef cattle. I suspect there may have been some important movement between these two categories over the past three censuses that would be missed if analysis were limited to 'sheep farmers' alone. The mixed cropping category of 'Grain-sheep and grain-beef' includes farmers who run few or no sheep, and to include them may distort the data. In this report, therefore, I have analysed combined data for the two groups, 'Sheep farmers' and 'Sheep-beef farmers'. Sheep-beef farmers in Australia numbered 12,798 in 2001 compared with 14,807 sheep farmers. There was no difference in the age profile of the two groups. In this report, where the term 'sheep farmer' is used, it means 'sheep or sheep-beef farmer'.

A farm family is defined as any family with at least one member describing their major occupation as farming. A sheep or sheep-beef farming family is a family in which at least one member describes his or her main occupation as farming and their industry is sheep or sheep-beef farming. In the occupational classification 'farmers', ABS counts only farm owners, owner-managers and managers. Stationhands, jackaroos, labourers and other farm workers are not counted.

## 1.5 Impact of changes in ABS industry coding methods

In coding industry data for censuses before 2001, the ABS used a conservative set of coding rules. Where there was any doubt about the agricultural industry to which a person should be coded, 'undefined' codes were used. This presented a particular problem for coding mixed farmers, many of whom run sheep, and resulted in the code 'Agriculture undefined' being used for a quarter of all employed persons coded to Agriculture in 1996. In some SLAs this conservative set of coding rules resulted in up to 30 per cent of farmers not being allocated to an industry. In preparation for the 2001 census the Australian Bureau of Statistics introduced new procedures for implementing the ANZSIC code for agricultural industries. As a result, the number of farmers coded to indeterminate codes, such as 'Broadacre Undefined', was substantially reduced (Table 1). Overall, the number of persons coded to 'Agriculture undefined' dropped tenfold. In SLAs where sheep farming is the dominant agricultural industry, the proportion of farmers allocated to undefined codes has now reduced to less than 3 per cent. Whilst this seems as first glance like an improvement, it has come at a cost. Where previously a farmer who nominated multiple broadacre industries in a combination that did not have a specific code was coded as 'Broadacre Undefined', in the 2001 census they would have been coded to the first industry they mentioned. This may or may not be their main industry: there is no way of knowing.

Table 1 Number of farmers in various agricultural industries, 1996 and 2001

| Industry | 1996 | 2001 | change | % change |
|---|---|---|---|---|
| Grain | 7,086 | 18,030 | 10,944 | 154 |
| Grain-Sheep and Grain-Beef | 23,849 | 39,832 | 15,983 | 67 |
| Sheep-Beef | 12,069 | 18,114 | 6,045 | 50 |
| Sheep | 13,688 | 23,897 | 10,209 | 75 |
| Beef | 22,247 | 47,150 | 24,903 | 112 |
| Grain Sheep Beef undefined | 13,683 | 2,036 | -11,647 | -85 |
| Total Grain Sheep Beef | 92,622 | 149,059 | 56,437 | 61 |
| Other livestock farming | 45,288 | 41,614 | -3,674 | -8 |
| Other livestock farming undefined | 3,728 | 2,225 | -1,503 | -40 |
| Total other livestock farming | 49,016 | 43,839 | -5,177 | -11 |
| Other crop growing | 57,639 | 82,551 | 24,912 | 43 |
| Other crop growing undefined | 12,058 | 4,890 | -7,168 | -59 |
| Total other crop growing | 69,697 | 87,441 | 17,744 | 25 |
| Agriculture undefined | 69,209 | 7,250 | -61,959 | -90 |
| All defined | 181,866 | 271,188 | 89,322 | 49 |
| All undefined | 98,678 | 16,401 | -82,277 | -83 |
| Total | 280,544 | 287,589 | 7,045 | 3 |

(Source: ABS Censuses of Population and Housing)

This change in coding method has introduced some difficulties in analysing the results of the 2001 census. There has been a significant increase in the count of farmers in most broadacre industries. For example, the count of cropping and mixed farmers nationally has risen from 26,000 to 46,000. In contrast, the change in coding appears to have had little impact on the count of dairy farmers. The reason is likely to be that, for most dairy farmers, dairy farming is clearly their predominant industry. Trend analysis of specific agricultural industries based upon raw data for broadacre industries may be unreliable. To overcome this difficulty as much as possible, I attempted to estimate the impact of recoding on counts of sheep and sheep-beef farmers. I chose the twelve SLAs across Australia in which sheep and sheep-beef farming were the most dominant agricultural industries. The selection criteria for these SLAs were that they contained 100 or more sheep and sheep-beef farmers in 2001 (raw figures) and that at least 75% of the farmers in them were sheep and sheep-beef farmers. The SLAs were Unincorporated Far West, NSW (90% sheep and sheep-beef), Bombala, NSW (88%), Paroo, QLD (86%), Snowy River, NSW (85%), Central Darling, NSW (84%), Crookwell, NSW (83%), Bourke, NSW (82%), Southern Grampians — Wannon, VIC (82%), Gunning, NSW (80%), Southern Grampians — Balance, VIC (77%), Guyra, NSW (76%), and Cooma–Monaro, NSW (75%). The per cent change in the total count of farmers in these twelve SLAs between 1996 and 2001 was applied to 1996 counts of sheep and sheep-beef farmers. Adjustment factors were then calculated as a ratio between these estimated sheep industry counts and the actual counts in 2001. Pro-rata allocation of coding changes between 1996 and 1991 indicated an adjustment factor of 0.75 should be applied to 2001 counts to allow a comparison with 1996 counts (Figure 1). (A similar exercise conducted using SSDs instead of SLAs arrived at a adjustment factor of 0.74.) All counts of sheep and sheep-beef farmers for 2001 were multiplied by the adjustment factor.

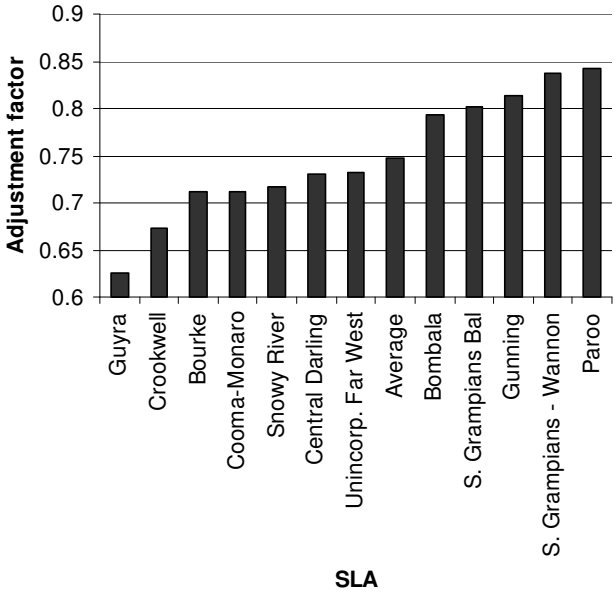



Figure 1 Estimates of adjustment to 2001 counts to overcome impact of changed ABS coding method on counts of sheep and sheep-beef farmers for sheep-intensive SLAs

ABS is considering its options for how to code industry data in the 2006 census, and I hope that whatever method ABS chooses will allow comparisons for single agricultural industries to be made with other censuses without the need to adjust industry counts. A major assumption I had to make in generating the adjustment factor was that the impact of ABS's coding change was felt equally across all the sheep farming SLAs in Australia. The fact that the adjustment factor varied between 0.63 and 0.84 across just the 12 sheep-dense SLAs used to generate the average adjustment factor suggests that this assumption is questionable. But, as with all assumptions, it was necessary to allow analysis to proceed.

## 1.6 Changes to Australian Agricultural Census data collection

During the period from 1983 to 1997, the Australian Bureau of Statistics conducted an annual census of all Australian farming businesses meeting a minimum gross income criterion. The next census was conducted in 2001. All farm business operators are required by law to complete and return the Agricultural census form. The Australian Agricultural Census (AAC) contains a series of questions on farm production and management techniques.

Data from the AAC is reported by farm establishment. In the AAC the establishment is the smallest unit of analysis within an SLA. 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 of the relative size of agricultural activity of each establishment. The ABS developed the concept to make a distinction between holdings that should or should not be included in its agricultural collection and to classify establishments into industries. The measure itself is called the Estimated Value of Agricultural Operations (EVAO). Prices used to create the EVAO are derived from many sources. The EVAO is created using a three-year weighted average to minimise volatility in the measure.

Between 1984 and 1997 the minimum EVAO required for inclusion within the census has varied inconsistently from $2500 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 $5000 (nominal) since 1993/94.

Analytical difficulties caused by the variable EVAO cut-off are 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 reduced the purchasing power of an Australian dollar by 18 per cent, effectively changing the real value of the cut-off EVAO. This implicit change in the cut-off EVAO would have little impact on estimates of the total amount of production. It will have a greater impact upon the less frequently used count of establishments.

The reduced census frequency since 1997 has necessitated changes in the methods used by the ABS to maintain an accurate list of agricultural establishments. Establishments are now identified by taxation records, rather than through tracing reported land sales. The impact of this change on establishment counts is unclear, and caution needs to be exercised in comparing establishment counts in 1996 and 2001. In 2001 the ABS also introduced a small number of demographic questions to the AAC. One of these was designed to determine the occupational status of establishment managers.

Our research group purchased data on the distribution of EVAOs for farm establishments that were classified as 'sheep farms' or 'sheep-beef' farms for selected years between 1983 and 2001. The categories for each year's EVAO distribution breakdown were adjusted for inflation to allow for comparisons based upon consistent 1997 real dollar values.

## 1.7 Regional analysis

To plot the location of Australia's sheep and sheep-beef farmers a set of 'sheep regions' was developed for this report (Figure 2). The regions were built up by aggregating SLAs. Individual SLAs are generally too small a geographic unit when data for people of only one occupation and industry are being analysed. Using individual SLAs would have resulted in many cells in the data tables containing 3 or fewer individuals. In such cases ABS randomly scrambles the data to protect individuals from being identified, by changing values of 0, 1, 2 or 3 to either 0 or 3. This decreases the accuracy of our research group's modelling algorithms for projecting future numbers and ages, so we aggregate SLAs into larger areas to increase cell sizes in the data tables. It would be possible to use SSDs, but their boundaries often do not match well with sheep producing regions. Therefore I developed a customised set of regions.

Several factors were considered in setting the boundaries of the sheep regions, both quantitative and qualitative. Quantitative factors included the number of sheep farmers and sheep-beef farmers in each SLA, the proportion of sheep and cattle farmers among the broadacre farmers in each SLA, and the proportion of sheep farmers among the sheep and/or beef farmers in each SLA. Qualitative factors included climate, topography, my knowledge of the different sheep production systems in different areas, our research group's observations of social trends in different landscapes, and the advice and assistance of departmental officers and leading sheep farmers and sheep industry professionals in various states.

Some of the regions have been given traditional names, such as Western District (VIC) and Granite Belt (QLD). Others have self-explanatory names, such as Pastoral (QLD) and Northern Mixed (NSW). Sometimes the sheep regions I wanted to use had boundaries that did not match with the boundaries of generally understood regions, so I had to invent my own names. For example, the Southern Hills region (NSW) contains parts of the regions traditionally known as southern tablelands and south west slopes.

I do not imply that the regions I have developed are in any way definitive, just that they seem useful for the purposes of this report. For example, in the high rainfall zone, hill country and tablelands are separated from plains country. The wettest parts of southern Victoria and Tasmania are also separated out because these areas have a higher concentration of meat sheep production than other areas. One small area of northern Tasmania (round Hagley and Whitemore) was once reputed to have the highest concentration of British Breed sheep studs in the world.

None of the individual regions cross state boundaries. Each region contains at least 100 sheep and sheep-beef farmers (as at the 2001 census), most contain at least 500, and some at least 2000. Our research group purchased custom tables of CPH data by region from ABS for 1991, 1996 and 2001. The 1991 and 1996 data were broken down by 2001 census boundaries to avoid any effects of boundary changes between censuses. Data for 1986 and earlier were not available by 2001 boundaries.

Areas with low numbers of sheep and sheep-beef farmers (fewer than about 10 per SLA) were expressly excluded from the analysis. These areas include: city and suburban areas; the coastal areas of New South Wales and Queensland; the cattle country of North Queensland; the entire Northern Territory, the Kimberly, Pilbara and Interior of Western Australia; the specialist cropping area of Western Australia (part of the central wheat belt); and western Tasmania.

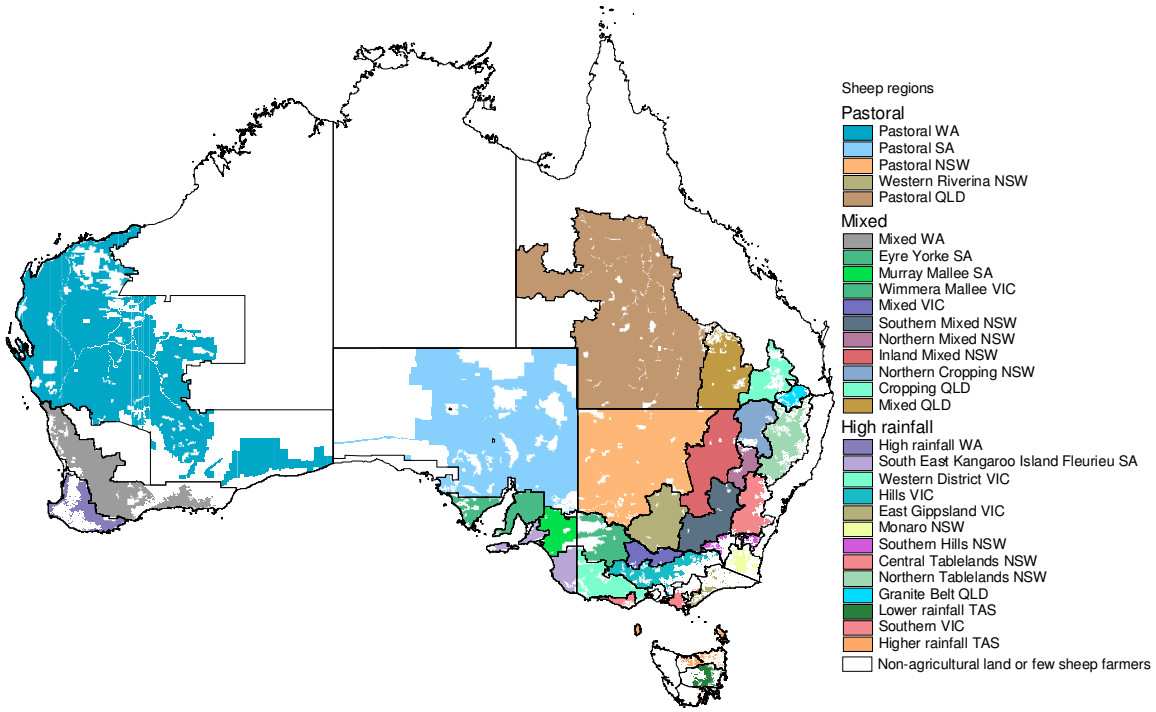



Figure 2 Sheep regions

Projections of the future demographic makeup of Australia's sheep farmers could not be made using the 29 regions, as there were too many age cohorts with no sheep farmers, particularly among the youngest cohorts. In these cases entry and exit rates cannot be calculated because it is not possible to divide by zero. The 29 regions were therefore amalgamated into 7 model regions (Figure 3). The Pastoral region includes

pastoral areas in all 4 states with pastoral country, and includes the Western Riverina. The Northern Mixed region includes cropping and mixed farming areas in Western Australia, New South Wales and Queensland. The Southern Mixed region includes cropping and mixed farming areas in South Australia and Victoria. The Southern Hills region includes the high rainfall area of Western Australia, the hill country of Victoria and southern hills of New South Wales, East Gippsland and the Monaro. The Southern Plains region includes the South east of South Australia, Victoria's Western District and the lower rainfall part of Tasmania. The Highest rainfall region includes southern Victoria and the higher rainfall part of Tasmania. The Tablelands region includes the Central and Northern Tablelands of New South Wales and Queensland's Granite Belt.

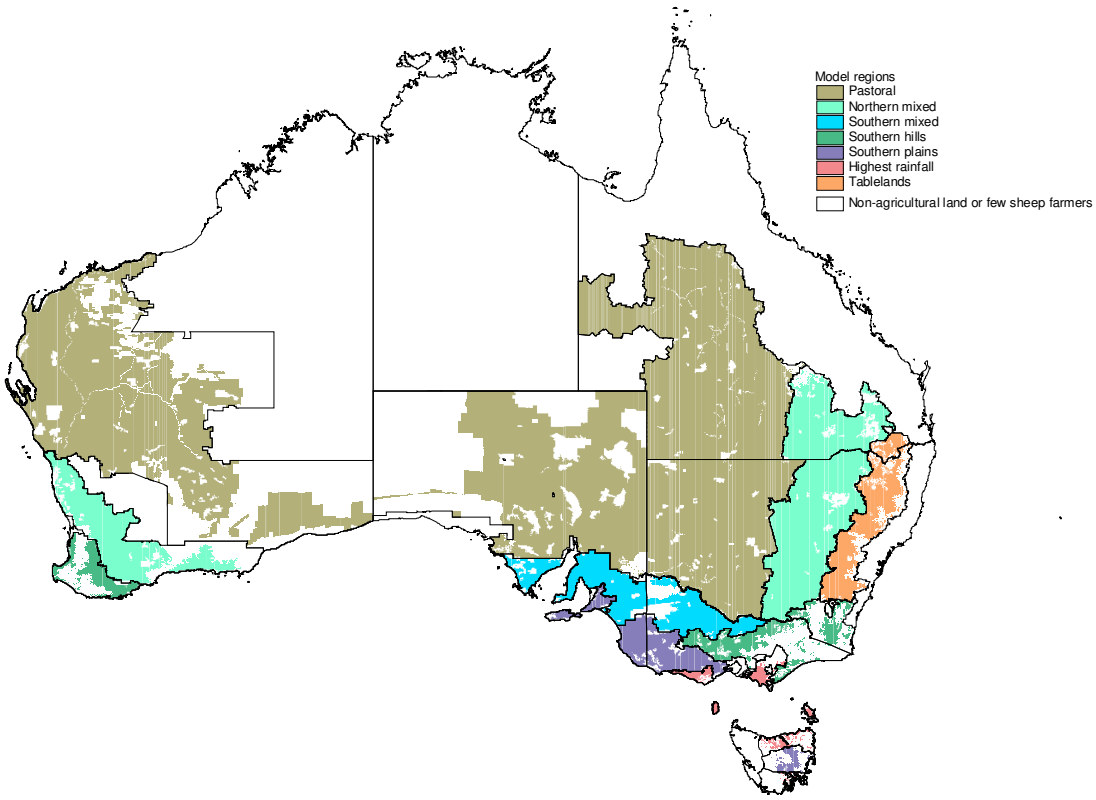



Figure 3 Model regions

# 2 Recent history of wool and sheepmeat industries

Demographic changes among Australia's sheep producers are best interpreted in the context of the marketing environment. The recent history of the wool industry over the past 25 years can be described in four periods:

- Reserve Price Scheme stability: During this period the real price of wool fell gradually.
- Wool price spike: For a brief period from late 1987 until mid 1988 the real price of wool rose well above the declining long term trend line. It then commenced a sharp fall.
- Depleting the stockpile: Following the dismantling of the Reserve Price Scheme, the price of wool remained subdued for much of the next decade while the wool stockpile was gradually sold.
- After the stockpile: The price of wool commenced a gradual rise with the final depletion of the stockpile, peaking in late 2002. During this period there was also a significant rise in the real price of sheep meat.

This report is in the main based upon data from the past 6 five-yearly Censuses of Population and Housing. The relationship between these censuses and wool and sheep meat prices is shown in Figure 4. The first three censuses (1976, 1981 and 1986) are from the period of relative stability during the operation of the Reserve Price Scheme. The 1991 census was conducted just after the price spike of the late 1980s. The 1996 census was conducted in the midst of the stockpile depletion period. The most recent census was conducted in the early stages of the post-stockpile period. The partial recovery of wool prices and good prices for sheepmeat had already had a significant impact upon sheep farming family incomes. Annual sheep farm cash surpluses had risen to their highest level in a decade (Figure 5).

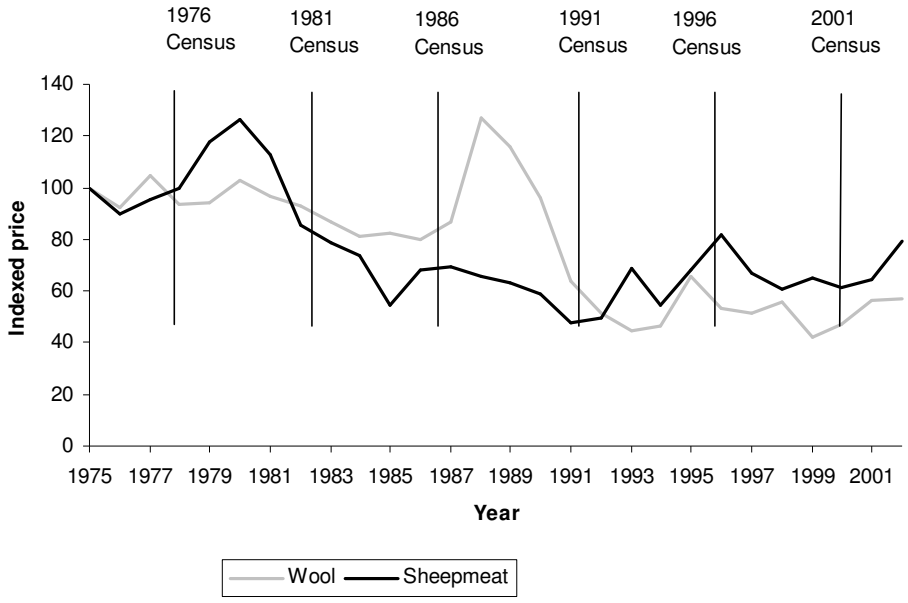



Figure 4 Indexed prices for wool and sheepmeat (base of 100 in 1975) and timing of population censuses 1976–2001 (derived from ABARE data)

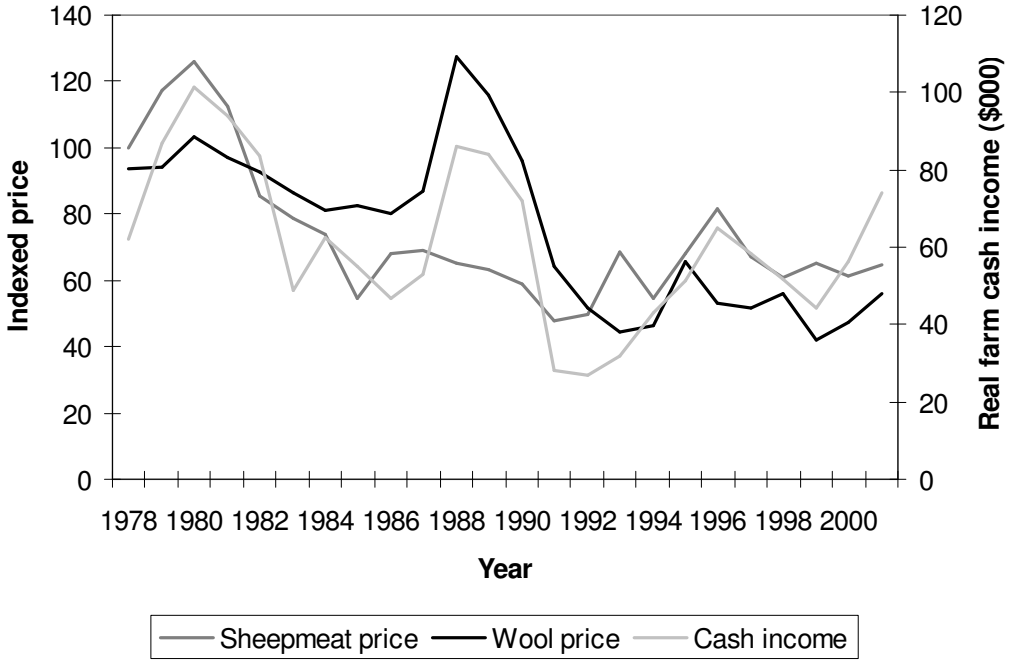



Figure 5 Real cash income on Australian sheep farms and indexed wool and sheepmeat prices (base of 100 in 1975) 1978–2001 (derived from ABARE data)

# 3 Occupational decisions of Australia's sheep and sheep-beef farmers

The demographic structure of Australia's body of sheep farmers is not centrally planned. No individual or group decides what the demographic structure will be at any particular time. Sheep farmer demographics are the outcome of relatively independent decisions made by many individuals about whether they will enter the sheep industry and, once in, whether they will stay in it or leave. Their decisions are made in the context of their perceptions of the market and the circumstances in which they and their families find themselves. Individual sheep farmers continually make and remake these decisions. Before describing the demographic structure of Australia's sheep industry, I describe the entry and exit processes that have been occurring over the past three decades.

## 3.1 Entry to sheep farming

I estimated entry to sheep farming using data derived from the ABS Census of Population and Housing. Respondents to the census are asked whether their home address has changed since the last census. I assumed that those who reported living at a new address and who described themselves as sheep farmers or sheep-beef farmers were new entrants to farming. There are three methods of entry to sheep farming that may be under-counted and one potential method of entry that may be over-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 apparent in anomalies in the measure of exits from farming.
- Family apprenticeship: Entering farming through inter-generational 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 (Stayner 1997; Garnaut and Lim-Applegate 1997). I 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 involve either return to farm from schooling or marriage. The extent of this form of entry was quite low. In those cases where younger persons enter farming through inter-generational transfer, their initial entry after schooling will be detected through basic population counts of young farmers. Their entry will again be detected when they change address to establish their own household.
- Change in major farm enterprise: This estimate will not identify those who have reduced the diversity of their farm business by shifting from mixed farming to solely sheep farming or to sheep-beef farming. The extent of this shift is unlikely to be significant given the higher returns from cropping over much of the period assessed in this study. This shift is most likely to be linked to a retirement-based strategy of reducing workload.
- Change of residential address unrelated to change in farm establishment. This indicator counts as new entrants to farming those who have continued farming but moved to a new address (whether to another farm or into town while still running the farm).

Figure 6 shows the number of entries into sheep farming and sheep beef farming for each inter-censal period between 1971–1976 and 1996–2001. There are clearly three separate patterns of entry that correspond to the phases of the wool industry discussed earlier. During the last decade of the reserve price scheme entry remained relatively constant at between 6000 and 7000 for each of three inter-censal periods. The price spike and dismantling of the reserve price scheme corresponded with a marked decline in the number of entries from 6600 to 4500. In the following inter-censal period to 1996 the decline in entries continued, with entries of 2800 being at their lowest level in the whole period under study. In the most recent inter-censal period, from 1996 to 2001, there has been a slight increase in entries to 3200, the first increase since 1971. However, the size of this increase and whether in fact there is an increase at all, depends on the size of the adjustment factor (described earlier in this report) use to correct for the unpublicised changes in coding procedures used by the Australian Bureau of Statistics for the 2001 Census.

Aggregate measures of entry only partly describe the changing nature of entry to sheep and sheep-beef farming in Australia. Counts of entry to farming are an aggregation of four quite distinct entry processes: traditional inter-generational transfer, late inter-generational transfer, property purchase and marriage.

- The traditional entry to sheep farming was once an informal farm apprenticeship, in which the younger generation joins the family business after their schooling. This is no longer the norm of entry to sheep farming. The number of sheep farmers aged in their 20s has fallen by 83 per cent over the 25-year period from 1976 to 2001. In 1976 the most common age of entry to sheep farming was between 25 and 29, but in 2001 there was little variation in the number of entrants between ages 25 and 64 (Figure 7). In 1976 there was an obvious peak in entrant numbers for both males and females in the late 20s and early 30s (Figure 8). In 2001, those few who do enter in their 20s are almost without exception young men (Figure 9).
- There appears to be an increasing trend towards later intergenerational transfer, where a son or daughter takes over farm management after a significant period working in another career. Stayner (1977) observed a high proportion of recent entrants to farming had spent considerable time in other occupations. The stereotype of the son working on the family farm and waiting until late middle age to be handed the chequebook is increasingly a phenomenon of the past. It may be being replaced by the phone call for help when the older generation can no longer manage the farm by themselves. The new, much less pronounced, peak entry age for Victorian sheep farmers is 35–39 years (Figure 7). Farmers in this age group would all have parents aged over 55 and many would have parents aged over 65.
- Independent purchase of a sheep property. This method of entry requires the entrant to accumulate capital in the early to middle years of working life sufficient to fund the purchase of land. This form of entry will mostly occur in late middle age or retirement. Entry of younger people by this method will necessarily be accompanied by a significant commitment to off-farm work to provide income to supplement the low income generated by a generally small farm and a low equity. Many people who entered by this method while young will not be counted in ABS sheep farmer counts due to the significant time commitment to non-farm employment. However, as these persons reduce debt and their children become financially independent, they will belatedly appear in the ABS count of sheep farmers as they reduce their commitment to non-farm employment. Older entry by this method (ages 50–65) is more likely to involve sheep farming being a solely male occupation with the wife working in another career. This explains why the increase in sheep farming entries in 2001 is mostly confined to males (Figure 6).
- Marriage into farming. Marriage is the usual state for sheep farmers aged 30 or older (Figure 10). As there are very few female sheep farmers aged younger than 30, it is reasonable to conclude that a greater proportion of women entering the sheep farmer statistics between ages 30 and 39 are doing so through marriage. This corresponds with the continuing trend towards later marriage in Australian society at large. However, a closer look at the available data suggests that relatively few women enter the industry through a traditional marriage into an existing sheep farming household. The peak of female entry to sheep farming at marrying ages in 1976 is no longer evident in 2001 (Figure 8, Figure 9). Many women who marry a sheep farmer will continue to work in an occupation other than sheep farming. Many of those women who do become sheep farmers will have jointly moved into the industry later in life.

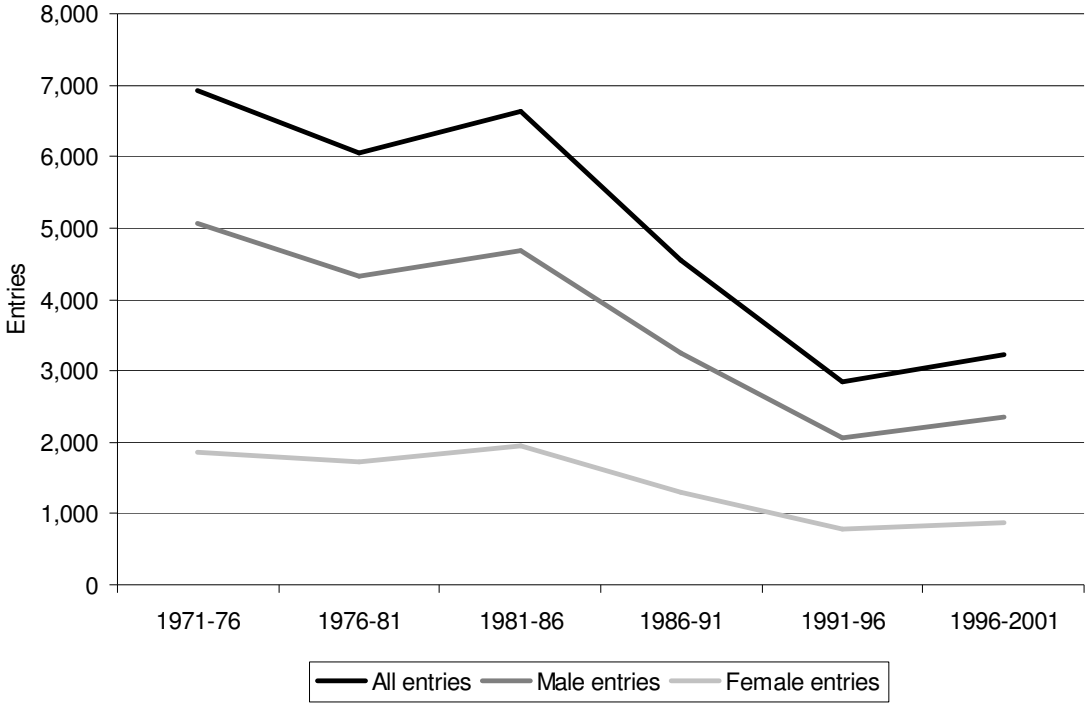



Figure 6 Number of entrants to sheep and sheep-beef farming, 1976–2001

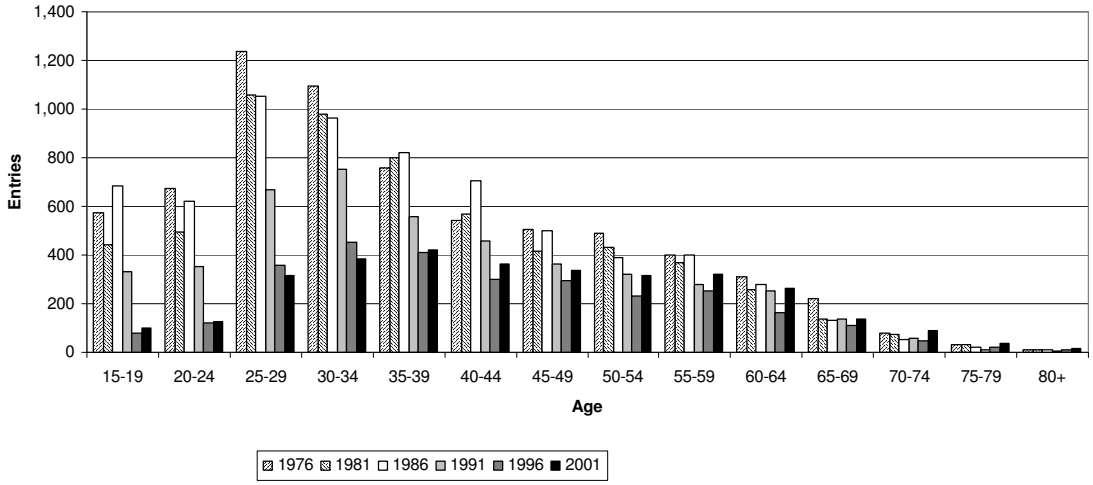



Figure 7 Number of entrants to sheep and sheep-beef farming by age, 1981–2001

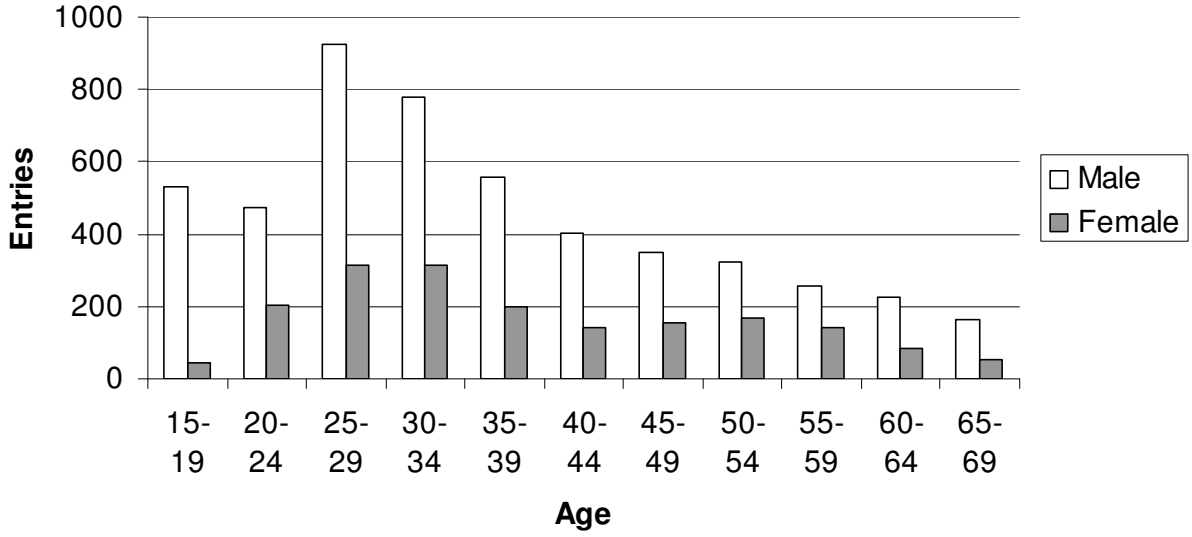



Figure 8 Entry to sheep and sheep-beef farming by age and sex, 1976

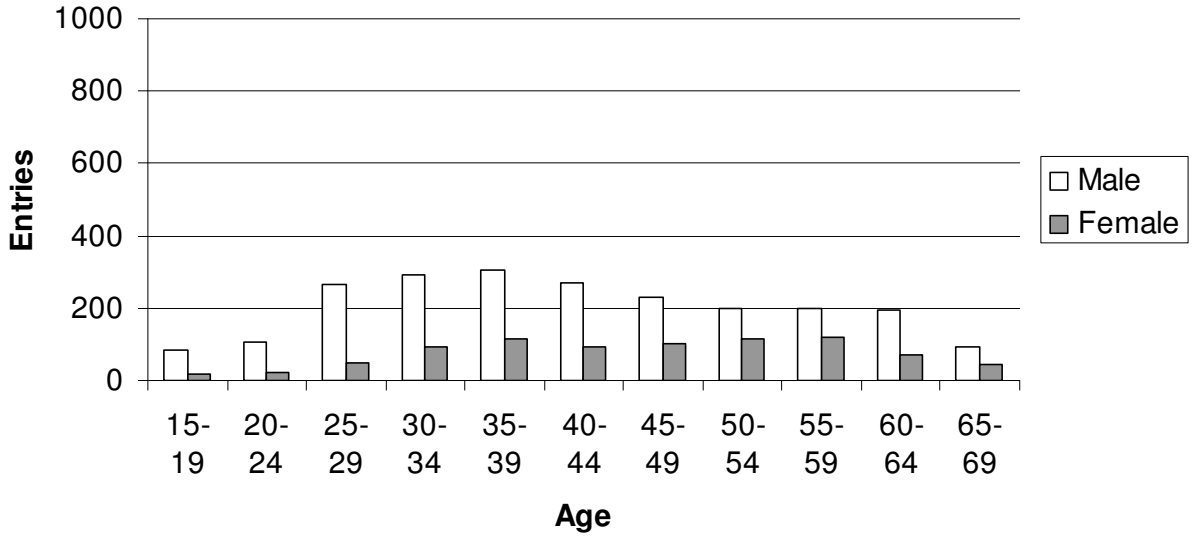



Figure 9 Entry to sheep and sheep-beef farming by age and sex, 2001


Figure 10 Marital status of sheep farmers by age, 2001

Although the raw number of entrants to sheep and sheep-beef farming has declined substantially over the years, the annual entry rate (number of entrants expressed as a percentage of total number of farmers) has remained remarkably stable over the past 6 inter-censal periods at between 3 and 4 per cent (Figure 11). The structural changes in Australia's sheep farmer demographics that have occurred in various phases over this period must therefore be caused not by entry rates, but by something else, whether exit rates or more likely variations in the age profile of entrants and exiters.


Figure 11 Annual entry rate for sheep and sheep-beef farmers, 1971–76 to 1996–2001

There is generally limited regional variation in entry rates. The high rainfall areas have low rates of entry to sheep farming between 1996 and 2001, with an annual rate of entry between 2.3 and 3.3 per cent (Figure

12). In contrast, the pastoral areas have high entry rates, between 3.3 and 3.7 per cent annually. All entry rates for pastoral areas are higher than for all high rainfall areas. Entry rates for mixed farming areas are spread throughout the range, with both the highest and lowest rates coming from these areas.

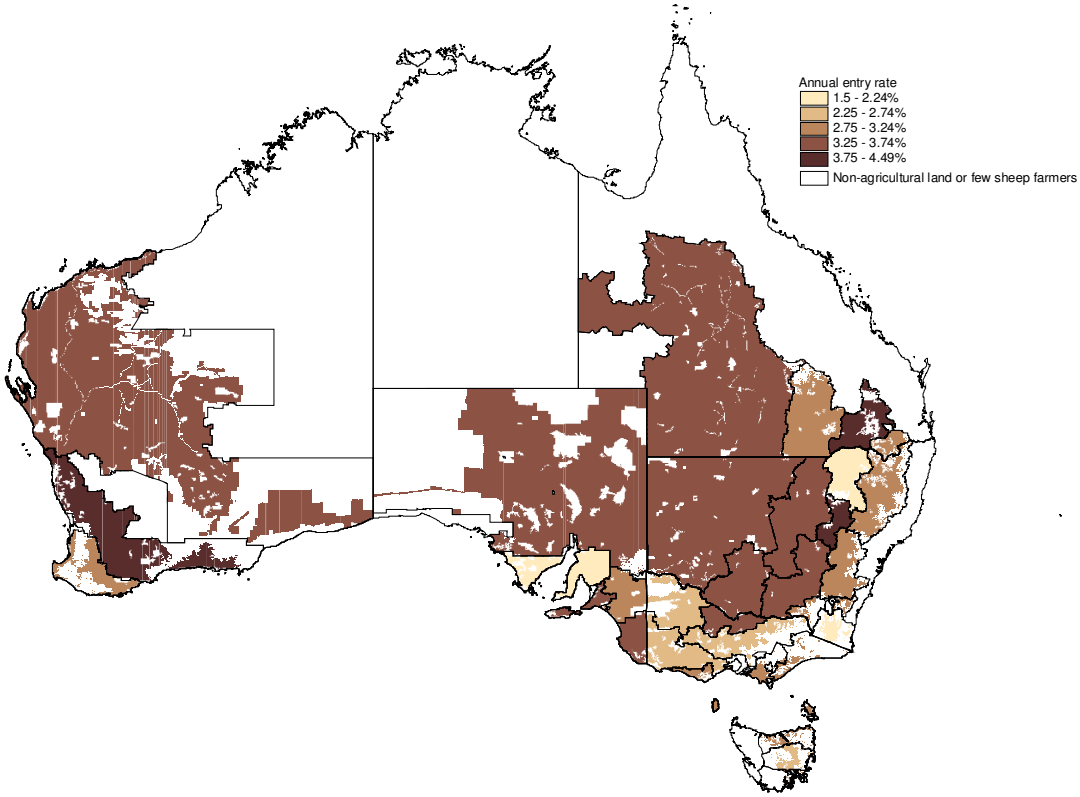



Figure 12 Annual entry rate, sheep and sheep-beef farmers by sheep region, 1996–2001

Confirming the pattern evident in a close examination of Figure 7, the median age of entrants to sheep farming has gone through two main phases since 1976 (Figure 13). It was relatively constant at around 34 years from 1976 to 1986, then commenced rising steeply, reaching 43 years in 2001. This represents a rise in median age of entrants of 9 years over a 15-year period. During the period of rapid adjustment between 1986 and 1991, associated with high wool prices and strong property turnover, the median age of entrants rose little, but during the period of slower adjustment since then the median age of entrants has risen rapidly. While the decrease in the number of entrants has now slowed, the increase in their median age has not. Sheep farming is not now a young person's game.

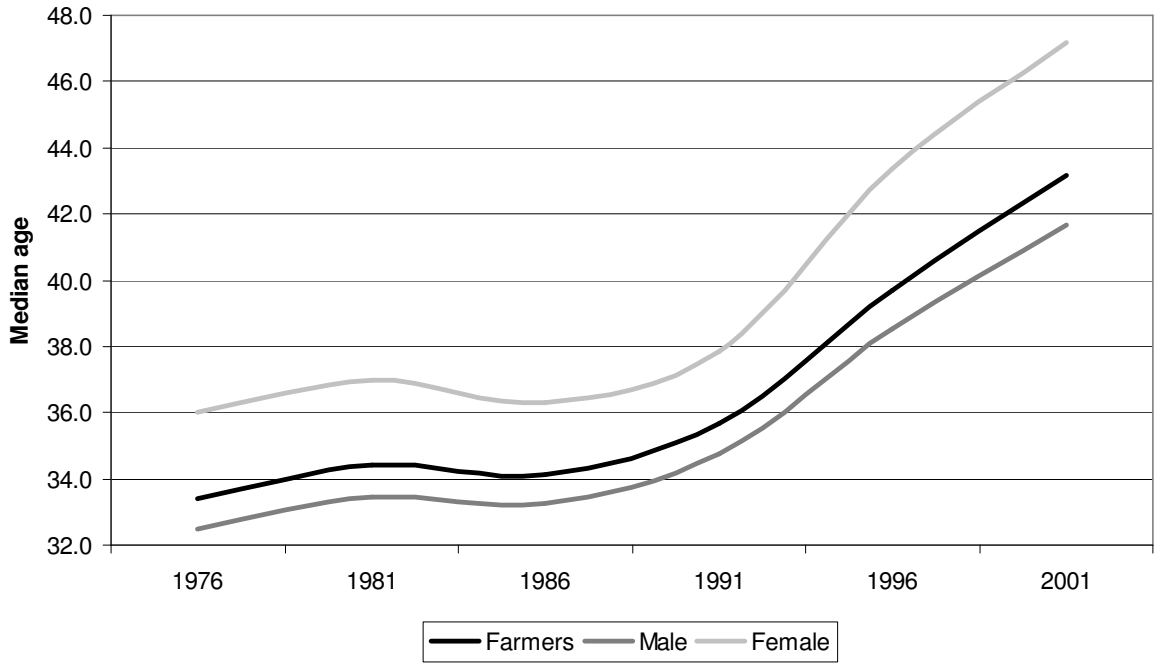



Figure 13 Median age of new entrants to sheep and sheep-beef farming, 1976–2001

In summary, there are now two age-related peaks for entry into sheep farming. The main peak is between the ages of 35 and 40 and there is also a much smaller peak between the ages of 55 and 59. The previously common younger entry is now relatively rare. Many older entrants may well be making a lifestyle choice to change careers later in life, perhaps returning to the family farm as their parents age.

## 3.2 Exit from sheep farming

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 picture of the sheep industry portrayed by ABARE and ABS income data during the period of stockpile depletion is one of generally low farm incomes, with families maintaining themselves by obtaining significant off-farm income. In the light of the low incomes of many sheep farming families through the 1990s, it is sensible to ask whether the industry saw an increase in the number of farmers exiting the industry.

Use of data from the Census of Population and Housing to calculate 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. A proxy measure of exit rates was calculated based upon the change in the number of persons calling themselves farmers between successive censuses and the number of in-migrants who identified themselves as farmers according to the following formula:

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

where

| | | |
|---|---|---|
| $EXITS_T$ | = | Number of sheep farmers exiting farming between year T−5 and year T. |
| $FARMERS_{T-5}$ | = | Number of persons describing themselves as sheep farmers in the census of year T−5. |
| $CONTINUING_T$ | = | Number of persons describing themselves as sheep farmers who did not change their usual address between year T−5 and year T. |

This method of calculating exits is equivalent to the following method, which was used in an earlier report by our research group (Barr 2001) and is 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 sheep farmers in year T |
| $ENTRANTS_T$ | = | Number of persons describing themselves as sheep farmers who changed their usual address between year T−5 and year T. These sheep farmers are assumed to be new entrants to farming. |

For the oldest age group, sheep farmers aged 80+, 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 sheep farmers exiting farming 1996 to 2001 |
| $FARMERS_{75(T-5)}$ | = | Number of persons aged 75 to 79 in year T−5 describing themselves as sheep farmers in year T−5 |
| $FARMERS_{80(T-5)}$ | = | Number of persons aged 80 or more in year T−5 describing themselves as sheep farmers in year T−5 |
| $CONTINUING_{80T}$ | = | Number of persons aged 80 plus in year T describing themselves as sheep farmers who did not change their usual address between year T−5 and year T. |

This method of estimation has a number of potential shortcomings, listed below. Because of these shortcomings, estimates of exit rates from this method must be treated with caution and used for relative comparisons rather than as nominal measures.

- There is no estimate for the youngest age cohort due to data and methodological limitations.
- Estimates of exit rates for the age cohorts 20–25 and ages greater than 80 are characterised by instability because of the low counts of sheep farmers.
- The estimate will include in its count those who have taken an off-farm job or changed agricultural industry in the inter-censal period and changed their occupation response to reflect this, even though they still continue to operate their farm. Thus, some former sheep farmers may have changed their commodity mix or diversified into other agricultural industries (in particular cropping) and, because they are no longer classified as a 'sheep farmer', would be counted in this analysis as having left the sheep industry. Likewise, those who have ceased non-farm employment but continued to work their farm will reappear in the count of farmers and reduce the estimated exit rate. The estimate of exit should be viewed as a combination of permanent exit from farming and the net outcome of change in occupational status between sheep farming as a major or minor occupation.

- Exit calculations are based upon data from two censuses. This increases the potential for error and is particularly significant because of the changes to the coding of industry data in the 2001 census. I have adjusted the 2001 data, as previously explained, but the estimate of exits is still likely to be less reliable than for earlier inter-censal periods.

The estimated annual rate of exit of Australian sheep farmers has fluctuated wildly since 1976, from highs of 8% between 1976 and 1981 and between 1986 and 1991 to a low of 2% between 1996 and 2001 (Figure 14). In contrast, the estimated exit rate for all Australian farming industries remained relatively constant at around 5% over the same period, apart from a peak of 6.5% between 1986 and 1991 (Barr *et al.* 2005). The fact that exit rates from sheep farming have fluctuated while those exit rates from all Australian farming have remained relatively stable suggests that much of the fluctuation can be attributed to movement from sheep farming into other farming industries rather than out of farming completely.

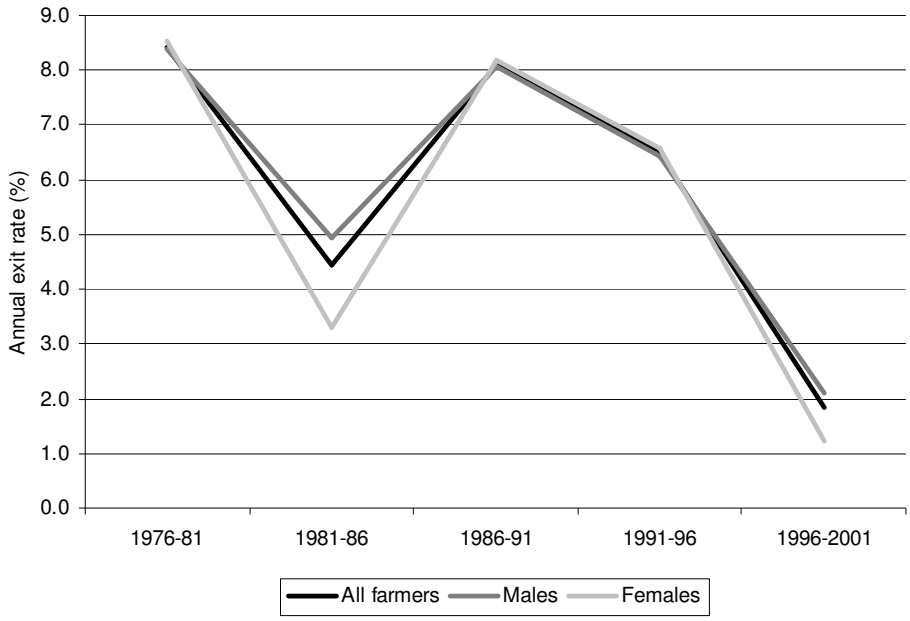



Figure 14 Estimated annual exit rate from sheep and sheep-beef farming, 1976–81 to 1996–2001

The number of exiting sheep farmers and the rate of their exit varies substantially between age groups (Figure 15, Figure 16). Until 1991 older sheep farmers had a higher rate of exit than younger ones. Since then, young and old sheep farmers have had the highest rates of exit and mid-career farmers have had the lowest rates of exit. There has been a marked decline in the exit rates of older sheep farmers from the industry since the 1970s. The rate of exit of farmers aged under 30 over the period from 1996 to 2001 was much lower than that observed in the previous 10-year period (Figure 16). This suggests a limited degree of increased confidence in the industry.

Since 1996, rates of exit from sheep farming have declined to their lowest level since 1976, reaching almost to zero for those aged between 50 and 64 (Figure 16). This is probably a net result of a higher exit rate in past years and a 'return' to sheep farming as a major occupation in their late middle age. The high exit rates after the 1989 fall in wool prices produced a large jump in the rate of exit from sheep farming, with rates for those aged younger than 55 more than doubling. It looks likely that many of these persons will have taken off-farm jobs after the collapse of the wool price, and maintained these off-farm jobs through the stockpile period. Most of these farmers will have passed the phase of greatest requirement for income to support the education of their children and will now be in a position to reduce off-farm work commitments and return to farming as their main occupation.

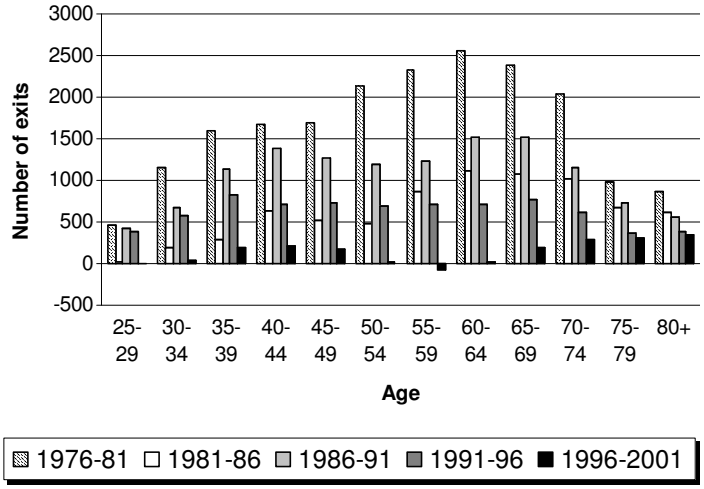



Figure 15 Estimated number of exits from sheep and sheep-beef farming by age, 1976–81 to 1996–2001

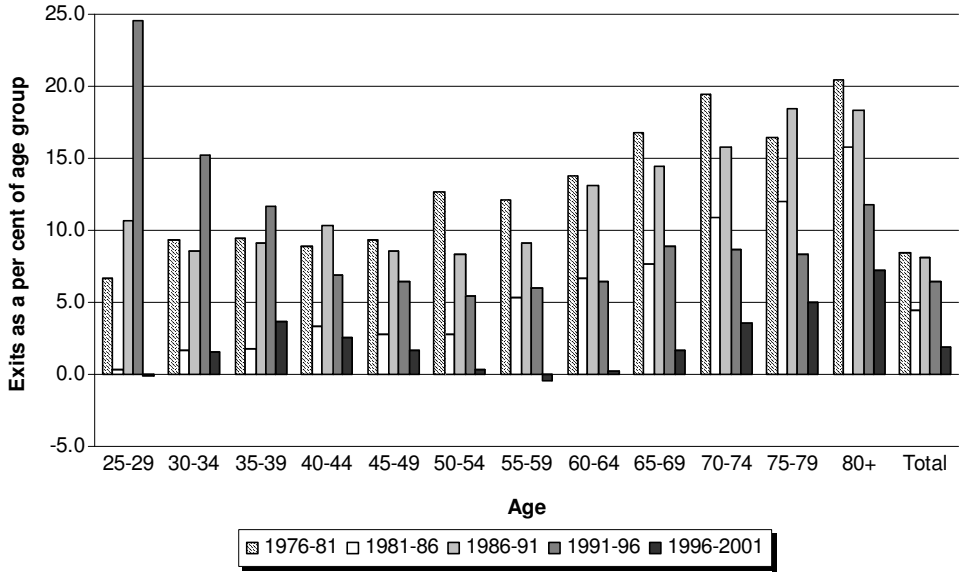



Figure 16 Estimated annual exit rate from sheep and sheep-beef farming by age, 1976–81 to 1996–2001

The motivation to exit sheep farming is driven by different factors for farmers of different ages. The youngest group of farmers are at an early stage of their working life and have the greatest number of working years in which to capture the benefits of a career change (Topel and Ward 1992). They are less likely than older farmers 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, so the need to maximise the sale price of their farm (not easy during a period of low commodity prices) will probably not influence them greatly.

Many in the mid-career group would have significant farm equity. Leaving farming would be less attractive to mid-career farmers as they would need to establish an alternative occupation but would have fewer years than the young to capture the benefits of this change. Their future financial security will be influenced instead by the price they receive for the sale of their farm, as they may need this money to establish another business. In a period of low commodity prices, this group often adopts a strategy of delaying any farm sale until there is a recovery in the land market (Core 1973). When facing a shortage of income, these farmers may take off-farm work during their 40s, but will mostly return to farming as their major occupation once their children are independent.

The older group of farmers will generally not be influenced by the labour market as their exit from farming will be part of a retirement strategy, whether formal or informal. Their farm equity will be significant and 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 advancing age. The result is an increasing exit rate with age and a reduced exit rate during periods of low commodity prices.

Comparison of the graph of exit rates (Figure 14) with the graph of estimated median age of exiting sheep farmers (Figure 17) shows that when exit rates are high the median age of exiting farmers is low, and vice versa. Exit rates of older farmers fluctuate less than those of younger farmers so when larger numbers of young people choose to exit sheep farming they both reduce the average age of exiters and increase the annual rate of exit.

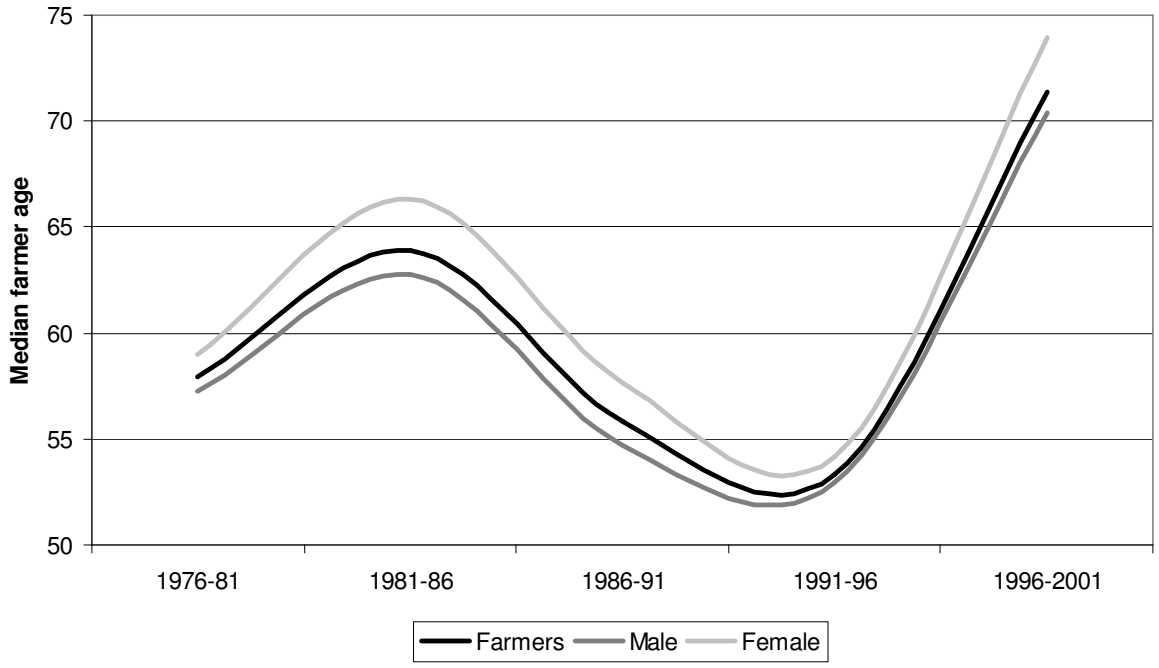



Figure 17 Median age of exits from sheep and sheep-beef farming, 1976–2001

# 4 Changing structure of Australia's sheep and sheep-beef industry

Given the changes that have occurred in entry and exit rates for sheep farming in Australia over the past three decades, along with the changes in median age of those entering and exiting, there must have been some changes in the demographic structure of sheep farmers. These changes in demographic structure are now described, and explained by reference to the changes in entry and exit.

## 4.1 Number and location of sheep farmers

The number of sheep farmers in Australia has reduced by more than half from 1976 to 2001 (Figure 18). This decline in numbers has not been uniform across the period, with the sharpest falls over the periods 1976–1981 and 1986–1991. The steep fall between 1986 and 1991 can be understood in the context of the spike in wool prices allowing a pent-up demand for woolgrower retirement to be released during a period of high prices for woolgrowing land. The other steep fall, between 1976 and 1981, is more difficult to explain. It would help if data for the period before 1976 were available, but data before 1976 are not available in a form that allows them to be directly compared with later data. The slight rise in sheep and sheep-beef farmer numbers between 1996 and 2001 may be an artefact of the changes in industry coding made by ABS between the two population censuses, as over this period the total number of Australian farmers did fall slightly, but may also be caused by some farmers moving back into sheep farming after a prolonged period of off-farm work (as explained earlier).

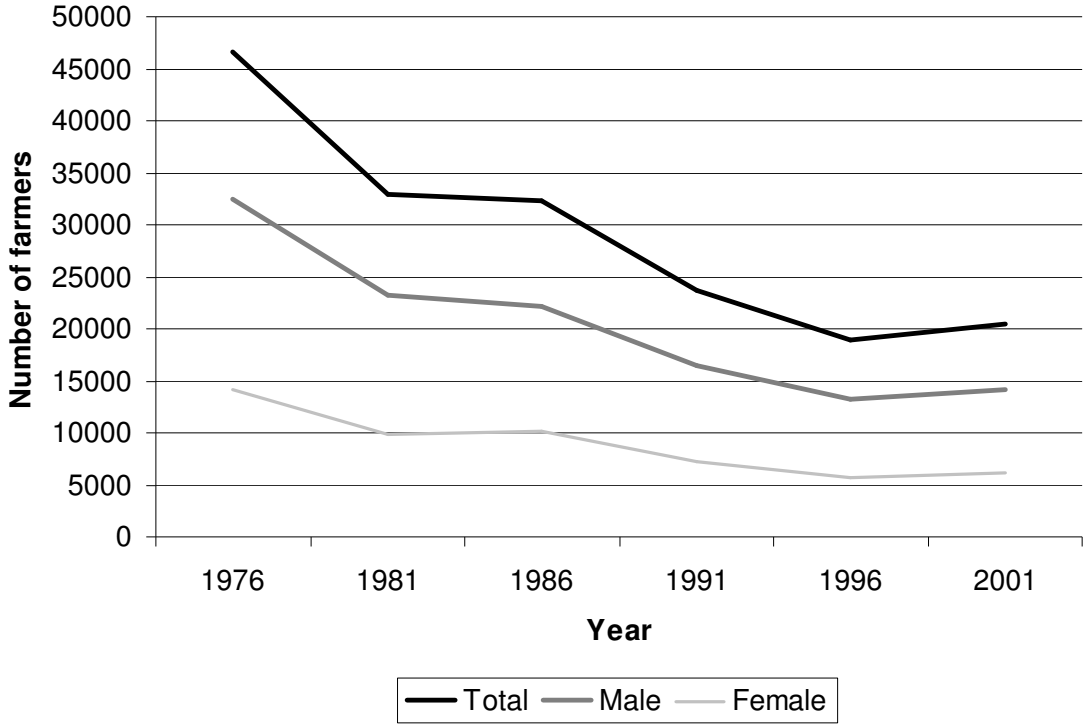



Figure 18 Number of sheep and sheep-beef farmers, 1976–2001

Geographically, Australia's sheep farmers are concentrated in the high-rainfall areas (Figure 19). The areas with the largest numbers of sheep farmers are the south-east of South Australia, the western district and the hills of central and north-east Victoria, and the central and northern tablelands of New South Wales. In the 2001 census these 5 regions held almost half (45%) of Australia's sheep farmers. The rest of the high rainfall zone accounted for only another 13% of the sheep farmers. The mixed farming and broadacre

cropping areas contained the next highest proportion (22%) of Australia's sheep farmers, and more than half of those were in New South Wales. In the pastoral areas (11% of the total), Queensland and New South Wales support larger numbers of sheep farmers than do South Australia and Western Australia. The highest rainfall areas of southern Victoria and a large part of Tasmania are relatively small and contain few sheep farmers (4%). These are the areas where meat sheep would be expected to predominate over wool sheep. Almost no sheep farming is carried out along the coastal areas of New South Wales or Queensland. Those areas, along with all other areas outside the designated sheep regions, including all city and suburban areas, accounted for only 5% of Australia's sheep farmers. Sheep farming is still predominantly an activity undertaken along the spine of the Great Dividing Range and in the plains country of south-west Victoria and south-east South Australia.

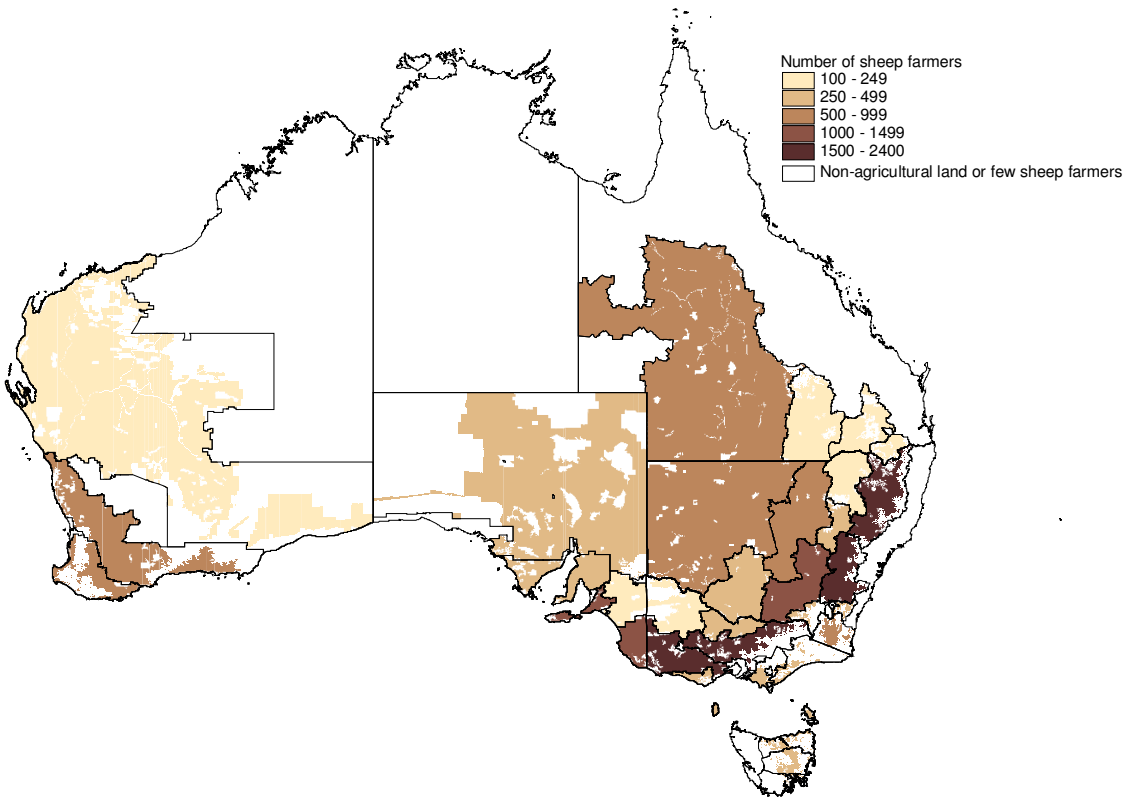



Figure 19 Number of sheep and sheep-beef farmers per sheep region, 2001

## 4.2 Age distribution of sheep farmers

Figure 20 portrays the age distribution of sheep and sheep-beef farmers in Australia for each census since 1976. There has been an on-going decrease in the number of sheep and sheep-beef farmers counted in age groups younger than 50. Sheep farmers aged younger than 30 are now quite uncommon. A different patterns is emerging for age groups between 50 and 65. Between 1976 and 1991 there was a large decline in the number of sheep farmers in this age group. However, since 1991 the number of these farmers has levelled out and begun to increase. This increase is probably due to a combination of older entry to farming and the reversion to farming as a major occupation after reducing off-farm work commitments. As a general rule, these forms of aged entry or re-entry are more common near major population centres.

The low rates of recruitment of younger farmers and the increase in extent of later career entry to sheep and sheep-beef farming have contributed to the average of Australian sheep and sheep-beef farmers rising by 3.2 years in the last inter-censal period (Figure 21). In 2001 the median age was 53.1 years. Over the past 10 years the median age of Australian sheep and sheep-beef farmers has risen by 6.4 years. With further re-

entry to agriculture to be expected, declining rates of older exit and the ongoing low rates of replacement, the median age can be expected to continue to increase in the current inter-censal period.

Two major social and economic forces are at work in fundamentally shifting the demographic structure of the sheep industry. The reduction in the number of young participants is the normal pattern of structural adjustment of a rural industry, where a family's exit decisions are concentrated at the point of inter-generational transfer. In the 1960s a US agricultural economist observed, 'men, once fully committed to farming, leave it reluctantly and slowly; but also because young men refuse to enter farming in past numbers as long as the income prospects are so poor' (Clawson 1963). As fewer farm children decide to take up sheep farming, the entry rate of young sheep farmers drops, and the fall in total numbers is proportionally greatest among the young.

The other force at work is the progression of the baby boomer generation through the occupation of farming. The sheep industry has seen two great inward migrations that are apparent in the data available to our research group. Many members of the generation born in the late 1920s entered the wool industry in their early 20s immediately after the Second World War. This generation was the most populated age cohort in the sheep industry in the 1976 and 1981 censuses. From age 60 onwards these farmers appear to have embarked upon strategies to retire from farming as part of an inter-generational transfer strategy. In the 1986 census they were replaced as the most populous age cohort by their children, the early baby-boomers. The transfer can be clearly seen in the bi-modal age distribution of sheep and sheep-beef farmers in the 1981 census (Figure 20). These baby-boomer farmers born during the period from 1946 to 1951 have been the dominant cohort of sheep farmers for the period from 1986 through to 2001 as their age cohort has shifted through the 35–39, 40–44, 45–49 and now 50–54 age groups. With the increased numbers of farmers in this age cohort returning to sheep farming as their major occupation, there is every reason to expect that by the 2006 census the 55–59 year age cohort will be the most populated. Unlike their parents, members of this baby boomer cohort are not showing the same inclination to retire. With far fewer of the next generation entering the industry, the only way many of them can retire is by selling the family farm. The unpalatability of such a choice is shown by the rising proportion of older sheep farmers.

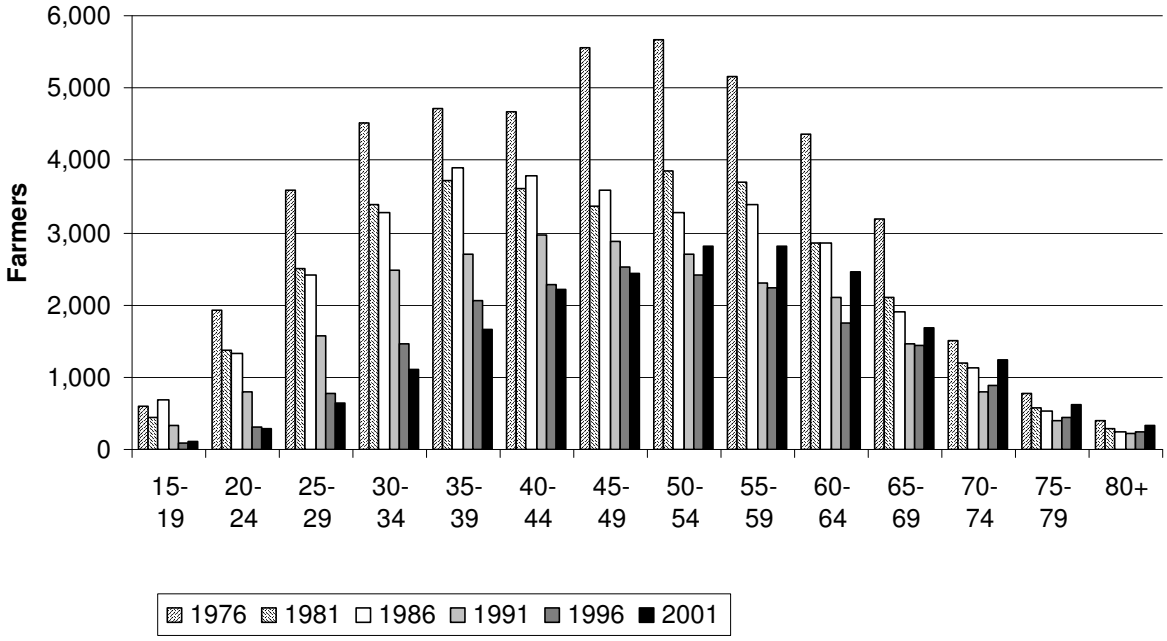



Figure 20 Number of sheep and sheep-beef farmers by age, 1976–2001


Figure 21 Median age of sheep and sheep-beef farmers, 1976–2001

The areas with the highest median age of sheep farmers in 2001 are those closest to Sydney and Melbourne. There is a band of undulating high-rainfall country stretching from Sydney to Melbourne, through the New South Wales central tablelands, southern hills and Monaro, through East Gippsland to the Victorian

hill country, where the median age is 55 or 56 (Figure 22). Queensland's granite belt also has a median age of 55. Generally, sheep farmers in the pastoral areas have the lowest median age. Across all the pastoral regions it is 49, and all pastoral regions except the western Riverina have a lower median age than all other regions. The pastoral areas of Western Australia, South Australia and Queensland are the only regions where the median age is below 50. Median ages in the mixed farming (53) and high rainfall (54) areas are higher, and apart from the high rainfall areas between Sydney and Melbourne with the highest median ages there is no discernible pattern. The cropping country around Gunnedah, Narrabri and Moree in northern New South Wales is an exception, in that the median age of its sheep farmers is as high as anywhere. However, it is predominantly a cropping area and not heavily populated with sheep farmers. Perhaps younger farmers in that area are focussed on cropping while leaving the sheep to their fathers and others of the older generation.

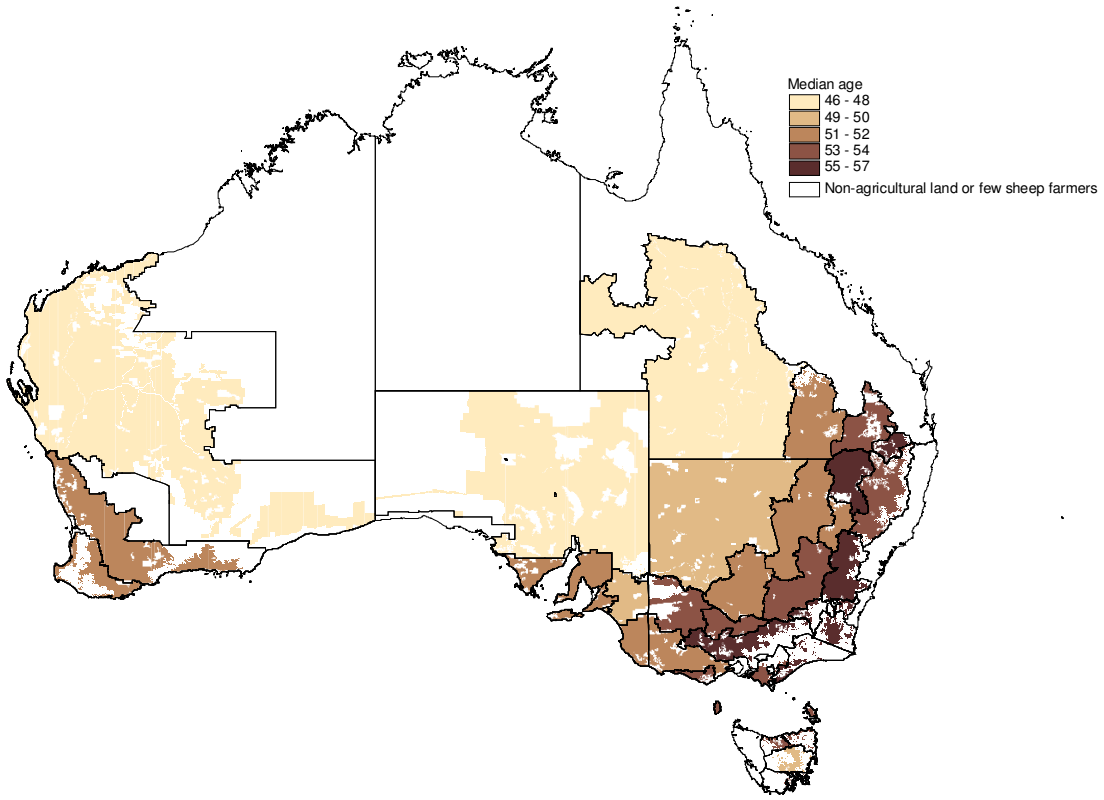



Figure 22 Median age of sheep and sheep-beef farmers by sheep region, 2001

None of the regions experienced a decline in median age of its sheep and sheep-beef farmers from 1996 to 2001, and only one (Victorian Wimmera–Mallee) experienced a decrease from 1991 to 1996. Over the 10-year period from 1991 to 2001 the average increase in median age across all Australia's sheep and sheep-beef farmers was 6.4 years, with all three of the main agronomic zones sharing a similar average increase. There were, however, substantial differences within zones (Figure 23). The major sheep-producing areas along the spine of the Great Dividing Range and into the Western District and the south-east of South Australia all showed a similar increase of between 5.5 and 6.5 years. Much of this area, particularly the hill country, now has sheep farmers with an age profile that is among the oldest in the country. The pastoral areas, still with a relatively young age profile, showed the greatest increase in median age over the period, with increases in all states but South Australia greater than 7.5 years. The age profile in the pastoral areas in 1991 (median of 42) was much younger than in the other zones (46 or 47) and is still relatively young. Pastoral areas are not an attractive destination for retirement sheep farmers.

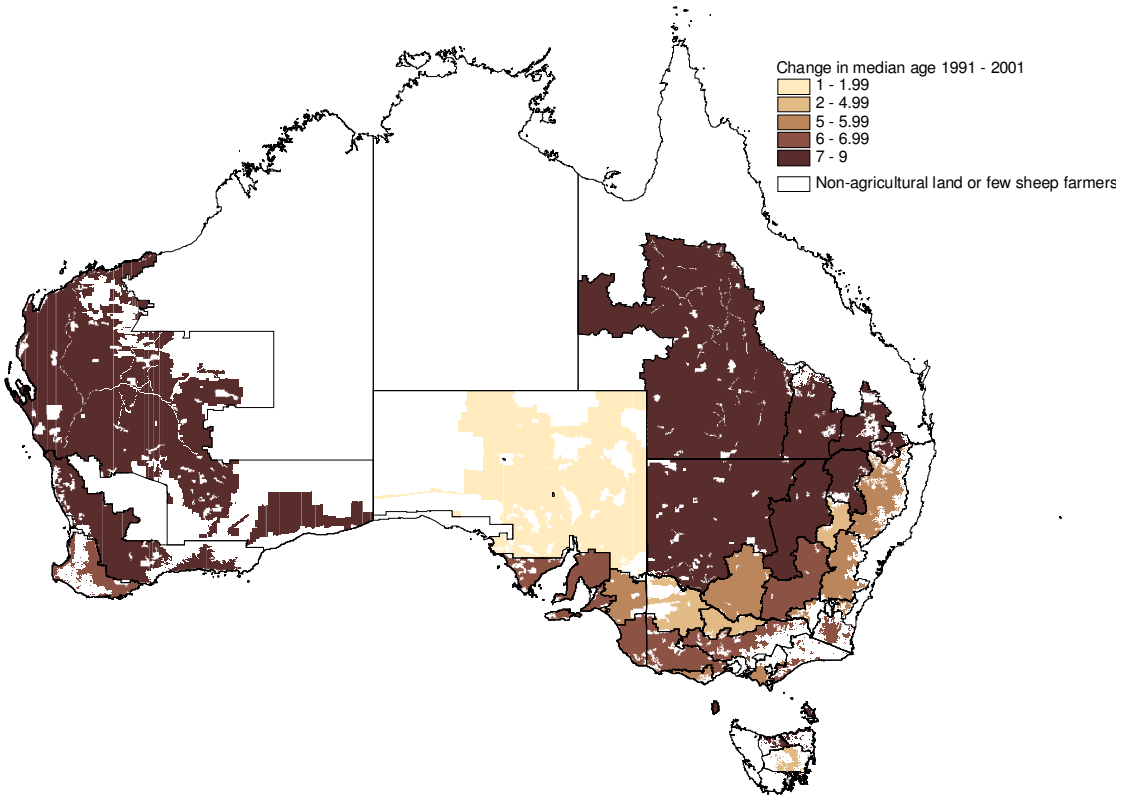



Figure 23 Change in median age of sheep and sheep-beef farmers by region, 1991–2001

## 4.3 Comparison with all Australian farmers

The decline in numbers of sheep and sheep-beef farmers over the past 30 years has followed a similar pattern to the decline in numbers of all Australian farmers (Figure 24). ABS figures for the total number of Australian farmers are unaffected by any coding changes they might make and are thus more stable a statistic than numbers for individual industries. The dramatic drop in sheep farmer numbers from 1986 to 1991, where numbers declined by 26 per cent in the heady period of adjustment during the spike in wool prices, was also experienced to a lesser degree among all farmers, whose numbers dropped by 16 per cent. Sheep farmers are included in the count of all Australian farmers, but the drop in their numbers over the period contributed only 3 percentage points of the 16 per cent decrease. Other industries were undergoing a similar, though less pronounced, period of adjustment at the same time as the sheep industry.

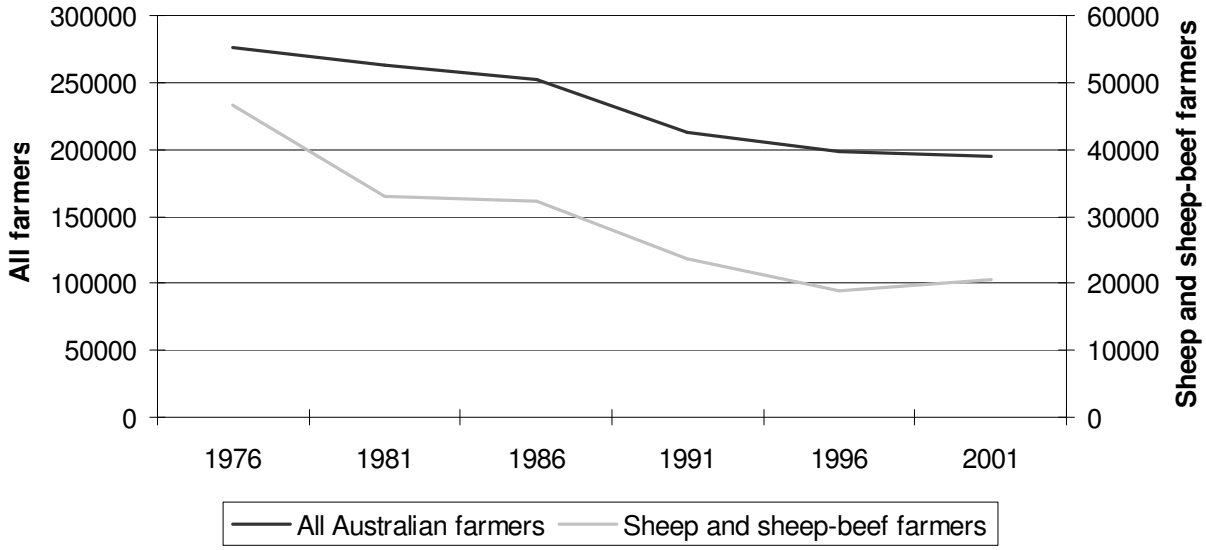



Figure 24 Number of sheep and sheep-beef farmers compared with all Australian farmers, 1976–2001

Changes in median age of sheep and sheep-beef farmers also followed the trend for all Australian farmers over the past 30 years (Figure 25). In all of the past 6 censuses sheep and sheep-beef farmers were on average older than farmers in other industries. The adjustment period of the late 1980s did keep sheep farmer median ages down, and closer to those of farmers in other industries, but since then they have increased at a faster rate than in other industries, to the point where in 2001 the median age of sheep and sheep-beef farmers was 3 years older than that for all Australian farmers.

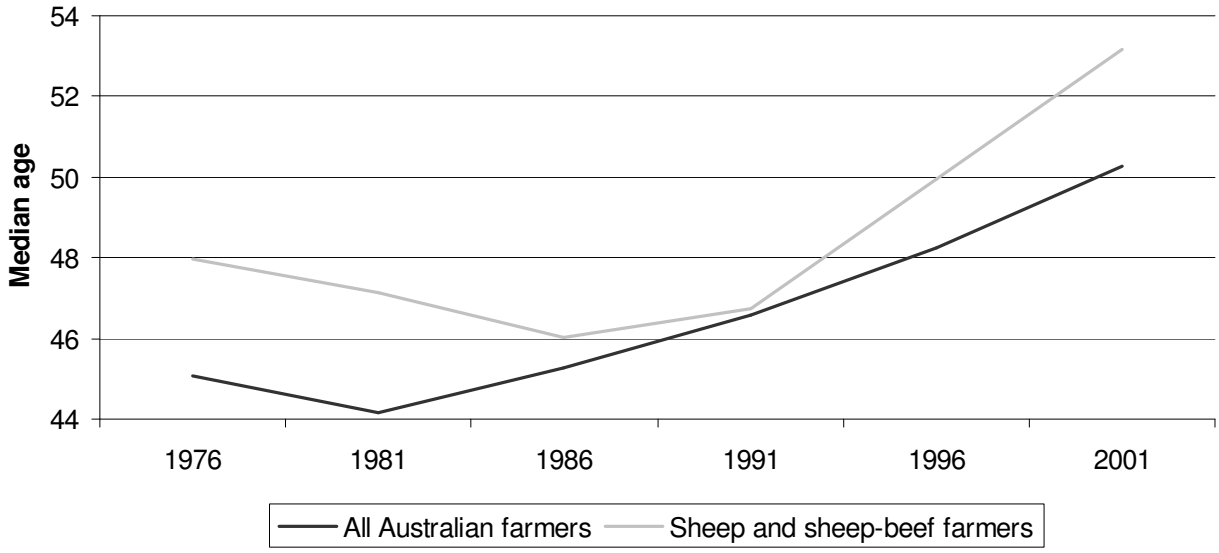



Figure 25 Median age of sheep and sheep-beef farmers compared with all Australian farmers, 1976–2001

## 4.4 Size of sheep farms

Figure 26 shows the distribution of sheep and sheep-beef farm EVAOs in 2001. In 2001, the high number of small farms dominated establishment counts. More than half of all sheep and sheep-beef establishments had EVAOs less than $100,000 (Figure 26). Smaller farms are much more likely than larger farms to have a manager whose major occupation is not farming. However, the majority of farms with less than $100,000

EVAO are still managed by someone who describes his or her major occupation as farming (Figure 27). This skewing of the farm size distribution towards smaller farm businesses means a large proportion of the value of production is produced by a very small number of sheep and sheep-beef farms. In the 2000–2001 season, the largest 10 per cent of sheep and sheep-beef farms produced 40 per cent of the value of production from all sheep and sheep-beef farms (as estimated by EVAO). The smallest 40 per cent of farms produced only 10 per cent of the value of production (Figure 28).

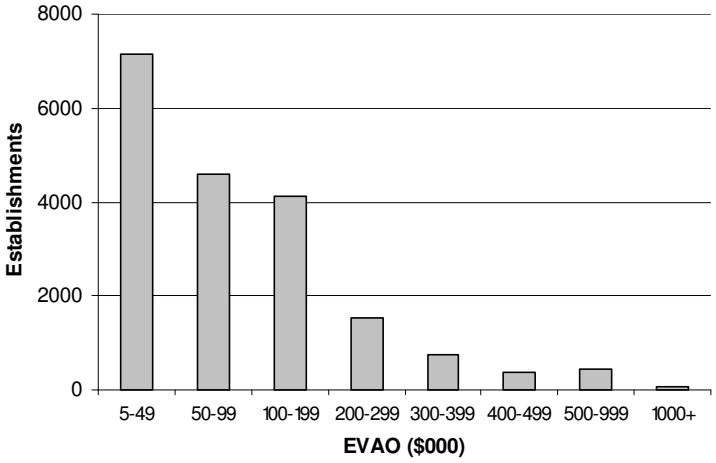



Figure 26 Distribution of sheep and sheep-beef farms by EVAO (in 1996 dollars), 2001

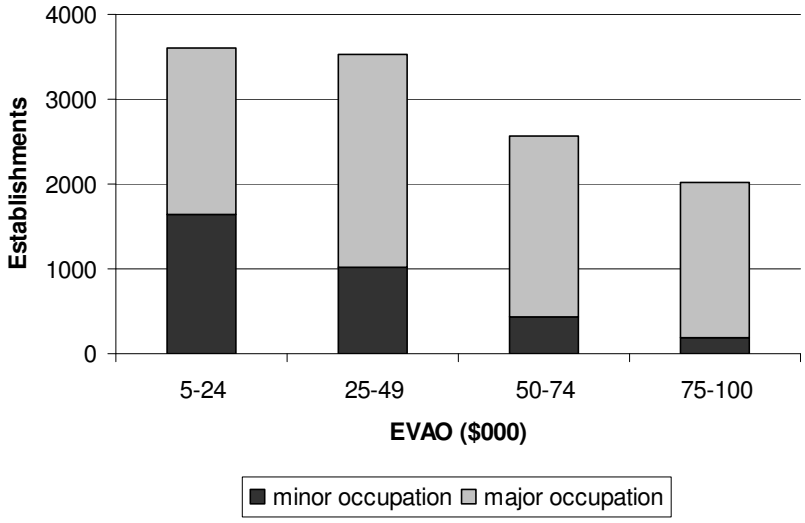



Figure 27 Farm size (1996 dollars) and whether farming is the major or minor occupation of the manager of small sheep and sheep-beef farms, 2001

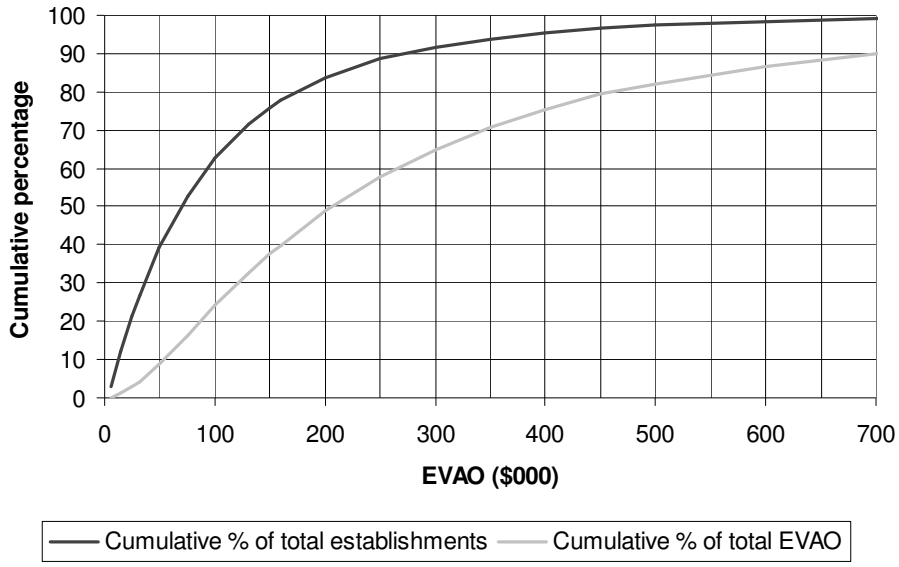



Figure 28 Cumulative distribution of farm establishments and farm EVAO, 2001 (in 1996 dollars)

## 4.5 Structural changes in summary

The number of sheep farmers in Australia has reduced by more than half from 1976 to 2001 (Figure 18). This decline in numbers has not been uniform across the period, with the sharpest falls over the periods 1976–1981 and 1986–1991. The decline in numbers has been most pronounced among the younger age groups (Figure 20).

The exit rate has been falling since its retirement-driven peak in 1986–91 during the period of relatively high wool prices (Figure 29). The entry rate has, however, remained relatively constant. What has changed about entry to sheep farming has been the median age of entrants. The substantial drop in the number of young sheep farmers, as shown in Figure 20, has been driven by a large reduction in the number of young people entering sheep farming, particularly those aged under 35 (Figure 7).

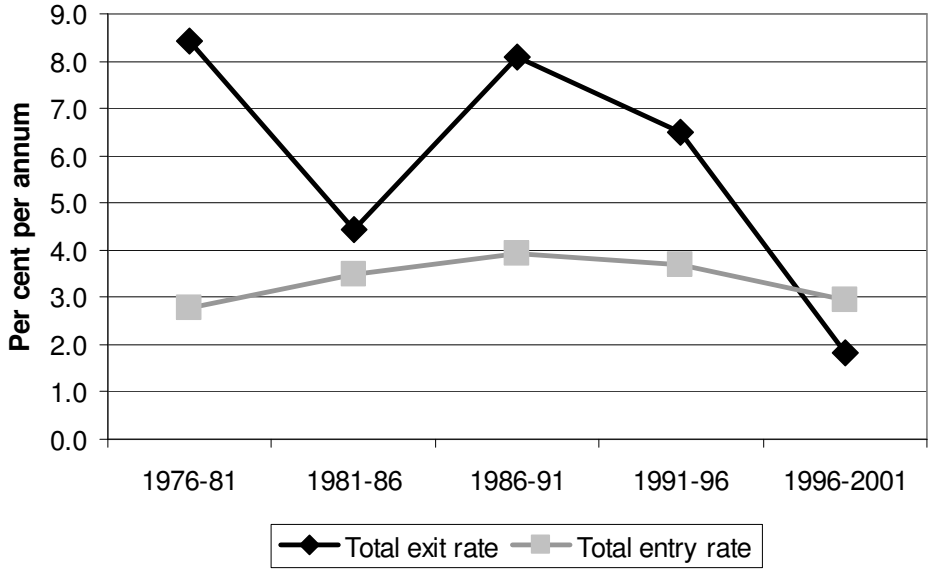



Figure 29 Entry and exit rates for sheep and sheep-beef farmers, 1981–2001

The consequence of these trends is that the median age of entrants to sheep farming, relatively constant from 1976 to 1991 at between 33 and 35 years, has increased by over 7 years to 43 years in the 10-year period from 1991 to 2001 (Figure 30). This has in turn driven up the median age of all sheep farmers over the same period.


Figure 30 Median age of entrants and all sheep farmers, 1976–2001

# 5 Modelling future Australian sheep farming populations

With fewer young people entering the Australian sheep industry with each succeeding census, and older people remaining in sheep farming until even greater ages, the demographic structure has already changed markedly over the past three decades. If these entry and exit trends are maintained, the demographic changes will also continue. But will the changes occur at a constant, increasing or decreasing rate? And what will be the future impact of the progression of baby boomers through the age cohorts? The following projection of likely future demographic trends, based on past trends, provides some answers to these questions.

## 5.1 Building the model

Our research group has used the historical measures of entry to and exit from farming to build a simple model of the future demographic structure of Australian sheep farmers. This model is based on observation of the tendency for decisions to leave farming to be driven by life cycle, except in periods of great external change. In the 1960s the US agricultural economist Marion Clawson summed up the place of family life cycle in these decisions: "Men once fully committed to farming leave it reluctantly and slowly … [and] young men refuse to enter farming as long as income prospects are poor" (Clawson 1963). Clawson was explaining the basis for his use of demographic data to model future farm populations. In our own modelling we have drawn on the work of Clawson and other farm demographic researchers in the USA and Canada that has showed the patterns of exit for each age group remain relatively fixed over time (Tolley and Hjort 1963; Kanel 1964; Smith 1987; Gale 1996; Gale 2003). This latter assumption is perhaps problematic for sheep farming.

The model is built on a simple stock and flow structure (Figure 31). The key parameters of the model are set out below:

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

The model is calculated for the model regions using parameters derived from historical farmer entry and exit behaviour displayed in each region. A more detailed description of the model can be found in the Appendix.

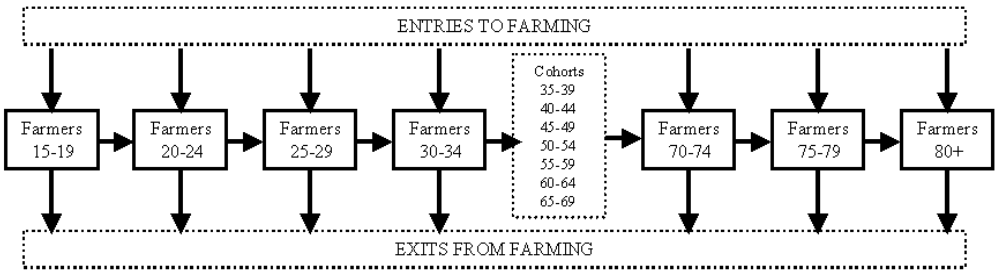



Figure 31 Adjustment model based on 5-year age cohorts

To operationalise this model I need to use estimates of exit and entry rates derived from previous intercensal periods. This leads to the question of whether these parameters are stable and, if not, whether they are subject to cyclical variation or longer-term changes. Figure 14 showed the ratio of exits to sheep farmer population. Over the past 5 intercensal periods it has varied from a high of around 8% in 1976–81 to a low of around 2% in 1996–2001. This is a much wider fluctuation that that for the Australian farmer population as a whole. The other major parameter for the model is the ratio of farm entries to farm exits. Figure 32 sets out the historical values for this parameter. Again, there is substantial fluctuation, more than that shown by the whole population of Australian farmers. Given the degree of fluctuation in entry and exit rates in the recent history of Australian sheep farming, it is difficult to choose the entry and exit rates of any one intercensal period as the basis for projecting future farmer behaviour. One possibility is to average the rates across two or more intercensal periods.

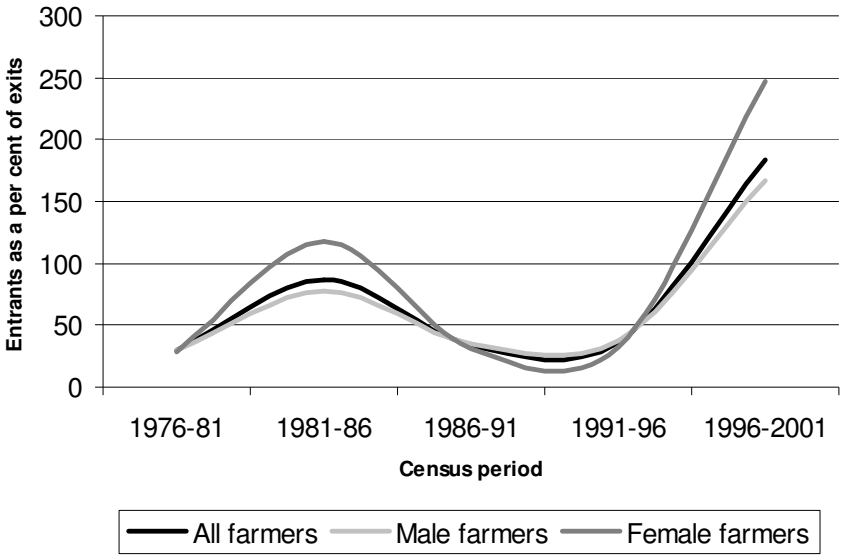



Figure 32 Entrants to sheep and sheep-beef farming as a percentage of exits in the same intercensal period

A further complication is introduced by the limited availability of data. While CPH data for Australia as a whole are available back to 1976, regional analysis by time series requires each census year's data to be according to consistent geographic boundaries. Data for 2001 boundaries are available back only as far as 1991. This provides 3 census years (1991, 1996 and 2001) or 2 intercensal periods of data (1991–96 and 1996–2001), and does restrict the options for specifying the main parameters of the model. Whilst it is not essential for the national and regional projections to be based on data for the same period, it is certainly desirable.

Our research group's previous modelling of the projected future demographic structure of all Australian farmers involved two separate models, using parameters derived from the 1996–2001 intercensal period and the average of the three intercensal periods between 1986 and 2001 respectively (Barr *et al.* 2005). The reason for this approach is that the two models made different assumptions about the adjustment patterns in agriculture. However, the historical entry and exit rates for the sheep industry do not display the same clean pattern as those for all Australian agriculture (compare Figure 14 and Figure 32 with corresponding figures in Barr *et al.* 2005). Because the adjustment patterns in a single industry sector may well be different from the farming industry as a whole, I considered using four different models. These use the entry and exit rates from the periods 1986–91, 1991–96, 1996–2001 and the average of the three periods between 1986

and 2001. The choice of period depends on data quality and beliefs about future product prices and likely adjustment rates.

The 1996–2001 model can be discounted immediately because of the coding problem that makes 2001 data difficult to compare with 1996 data. The other three models have some claim to validity. Each is based on a period in which different things happened in the sheep industry. The 1986–1991 model is based on a period of historically high wool prices and great optimism about the future of wool (although sheepmeat prices were relatively low), in which an unusually large proportion of sheep farmers took the opportunity to leave the industry. This period also included the dismantling of the once great reserve price scheme. These times were not typical of the past 30 years for the sheep industry. A model based on this period can be expected to project high and possibly unrealistic adjustment rates. Further, for this model to be realistic, one would have to expect high a future of high prices for wool and sheepmeat. The 1991–1996 model is based on a period of relative stability but low prices for wool and sheepmeat. The 1986–2001 model includes both these periods, as well as the 1996–2001 period for which the data are unreliable. The validity of this model is thus weakened, but perhaps not greatly since the entry and exit rates of the problematic periods tend to oppose each other so that their effect are diluted by averaging.

The three models project very different trajectories of sheep farmer numbers in the future (Figure 33). Both the 1986–91 and the 1991–96 models, which are based on periods of adjustment out of sheep farming, project a gradually slowing decline in numbers. The average model projects little change.

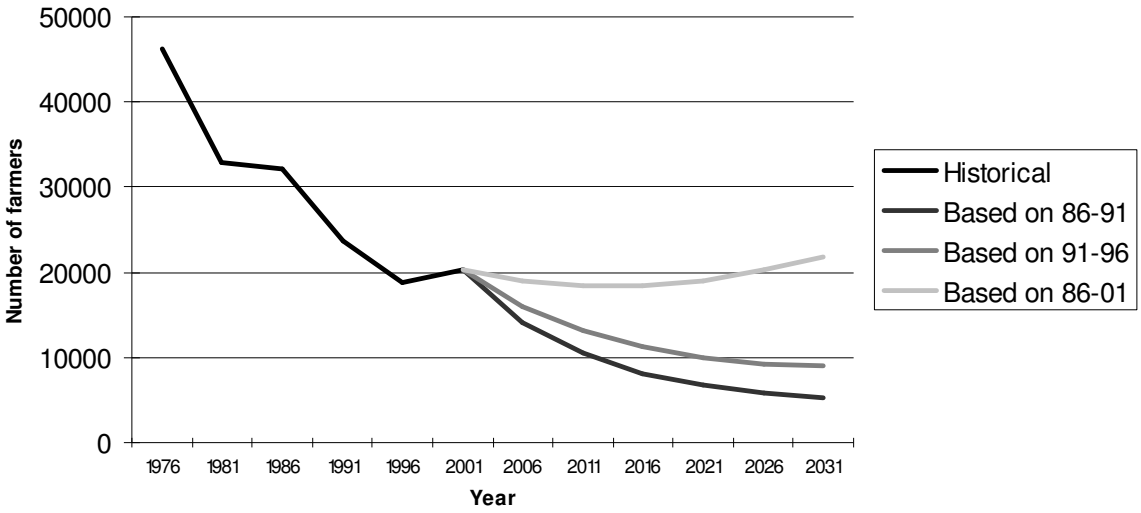



Figure 33 Historical and modelled future sheep farmer population using parameters derived from the periods 1986–91, 1991–96 and 1986–2001

Projected changes in median age of Australia's sheep farmers also vary between the three models, but not as greatly as for farmer numbers (Figure 34). In this case the 1986–91 model is the odd one, projecting that the past sharp increase in median age will suddenly stop, to be replaced by a slight linear increase over the modelled period. This was, after all, the period of most rapid adjustment in the recent history of the woolgrowing industry, and rapid adjustment is indeed associated with a median age that, if not declining, is at least rising only slowly. The other two models project a median age gradually increasing to a peak, perhaps even decreasing after the peak, a phenomenon that would be expected given the progress of the large cohort of baby-boomers through the age profile. The average model projects an increase in median

age of 2.5 years over the next 30 years, while the 1991–96 model projects an increase in median age of 6.5 years.

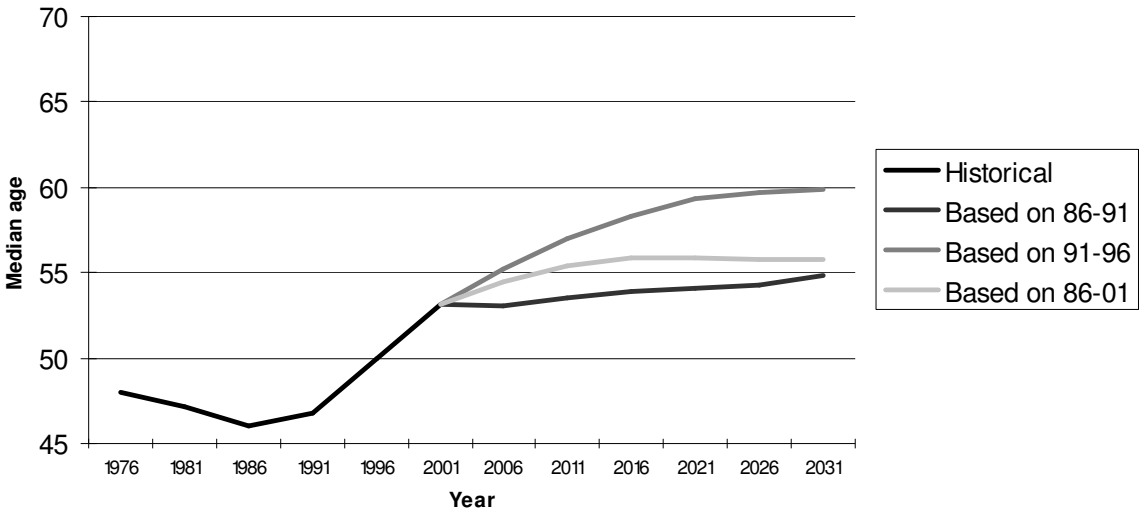



Figure 34 Historical and modelled future sheep farmer median age using parameters derived from the periods 1986–91, 1991–96 and 1986–2001

Having already discounted the 1996–2001 model because of its coding problems, we now discount the 1986–91 model because of its counter-intuitive projection about median age. This leaves the 1991–96 and 1986–2001 models. The projections in the rest of this report are based on these two models.

## 5.2 Projected future national demographic structure

The model based on the period 1986–2001 represents the most conservative estimate of what is likely to happen to sheep farmer demographics over the next 30 years. It projects roughly constant numbers and only a slight increase in median age that peaks by 2016 (Figure 35). The model based on the period 1991–96 is much less conservative than the other model. It projects that the number of sheep and sheep-beef farmers will drop by slightly more than half over the next 30 years, a rate of attrition only slightly slower than that of the 25-year period from 1976 to 2001. It also projects that the median age will rise by 6.5 years over the next 30 years, a rate of increase only slightly faster than that of the 25-year period from 1976 to 2001. In projecting a future that is like the past it does appear to offer a middle path, one that is neither conservative nor alarmist. Another way of looking at the 1991–96 model suggests that it may well offer an extreme view. Only one other model tested projects a greater decrease in numbers, and that is the 1986–1991 model, which is based on the most dramatic period of adjustment in the wool industry in recent decades. None of the other models tested project a greater increase in median age. The 1991–96 model appears on this analysis to be toward the extreme end of the range of projections. Which of the two views is more reasonable? Given that the model projects that future demographic change will happen at the same rate as past change, it is certainly possible to imagine a model that would project faster demographic change in future. And the period from 1986 to 1991 did involve faster structural adjustment in the wool industry than the period from 1991 to 1996 on which the model is based. So the model does not provide the most extreme view of what might happen to sheep farmer demographics in the future. Instead, it seems to offer a relatively balanced view of future demographic change at a rate similar to that of the past, with the rate of change eventually slowing, leading to a stable demographic structure of fewer but on average older sheep farmers at about the point in the future when the baby-boomers have retired.

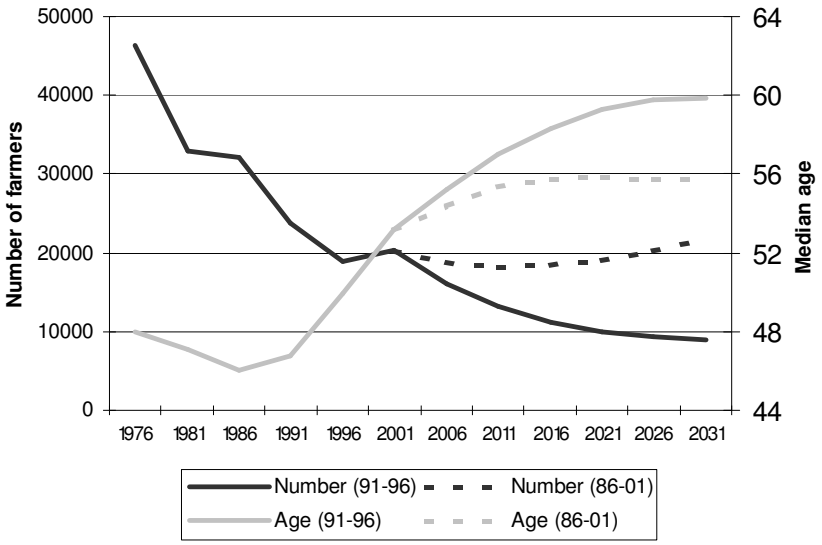



Figure 35 Historical and modelled future sheep and sheep-beef farmer population and median age

Past trends in the number and median age of sheep farmers have not been steady. Numbers have trended downwards but not always at the same rate. There have been periods with steep falls and periods with more gentle falls in numbers. Median ages have sometimes decreased, but since 1986 have increased, though not always at the same rate. It is reasonable to expect that the variation that has occurred in past trends will continue into the future, although because the modelling uses a single set of entry and exit rates for each age cohort over all the inter-censal periods modelled the future projections do not display the lumpiness of past trends.

Behind the projected increase in the median age of sheep and sheep-beef farmers lie two phenomena: one concerning the very young, the other the very old. First is the almost complete disappearance from the industry of those younger than 30. Second is the explosion in the number of farmers aged 80 and over (Figure 36, Figure 37). In the 1991–96 model farmers aged under 30 are projected to virtually disappear from the sheep and sheep-beef industry, while in the 1986–2001 model small numbers of these young farmers are projected to remain (Figure 37). The large and increasing number of sheep farmers aged 80 and over is not an artefact: it occurs no matter what assumptions are made about entry and exit rates. This includes unlikely scenarios not reported here. In no case was the number of 80-year-olds in 2031 projected to be fewer than 1000. The same is true of the disappearance of the youngest farmers: none of the models tested project that the number of young farmers will remain in similar numbers to those of today.

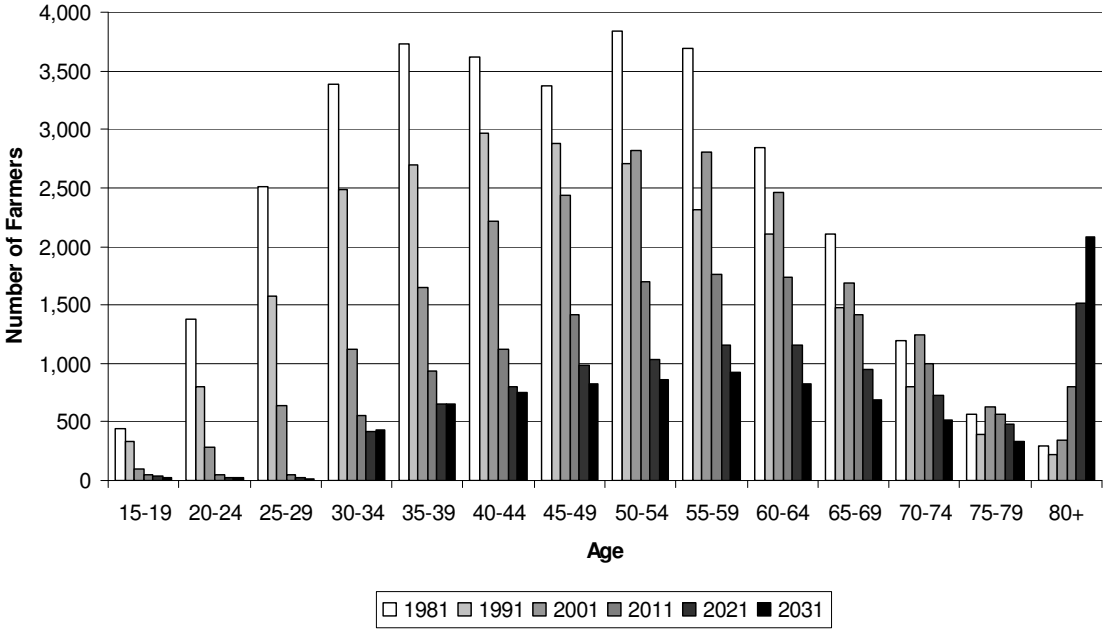



Figure 36 Historical and projected sheep farmer population by age (based on 1991–1996), 1981–2031

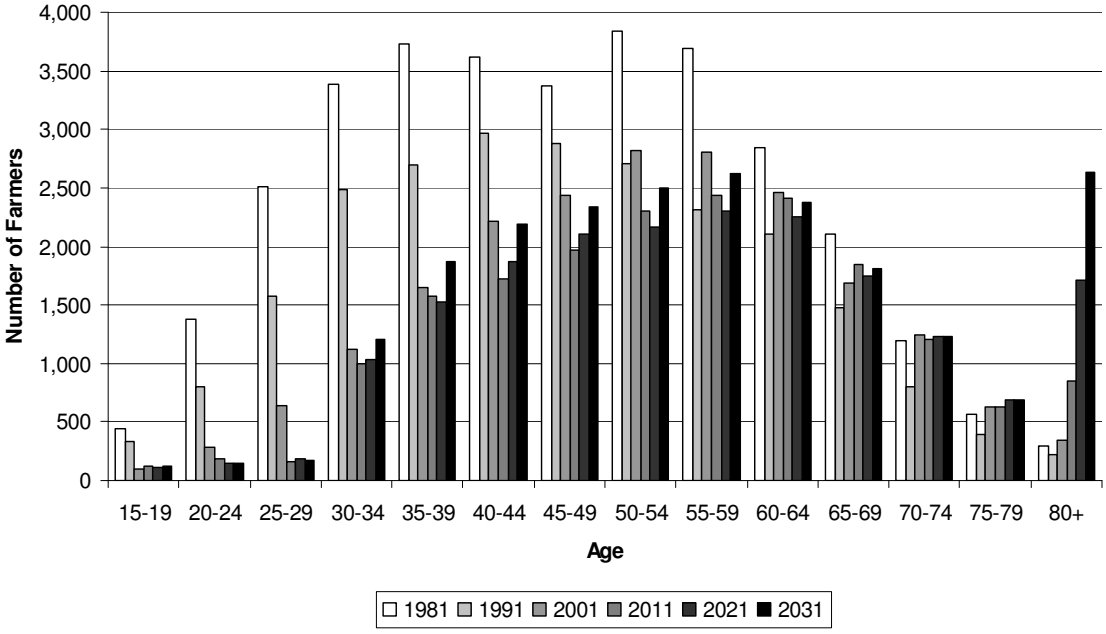
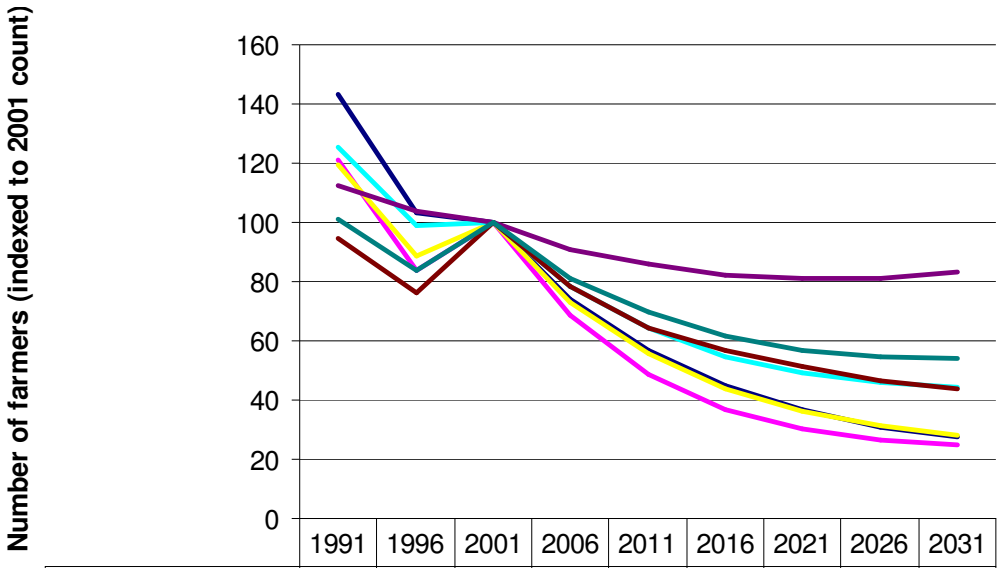



Figure 37 Historical and projected sheep farmer population by age (based on 1986–2001), 1981–2031

## 5.3 Projected future regional demographic structure

Applying the model based on 1991–96 to each of the model regions separately shows that the number of sheep and sheep-beef farmers is projected to decrease in each of the regions (Figure 38). The degree of depopulation varies between regions, with Southern plains projected to lose few of its sheep and sheep-beef farmers, but the pastoral areas and the two mixed farming regions losing almost three-quarters of

their sheep and sheep-beef farmers. Southern plains is the most populous of the sheep regions and is projected to remain so. It is home to many substantial sheep farming businesses, sufficiently large to remain viable for some time, in areas where alternatives to sheep farming have been attempted but have not always succeeded. In contrast, the mixed farming areas by definition offer alternative enterprises to sheep farming and are the areas most amenable to shifts in enterprise mix. The population loss of sheep and sheep-beef farmers projected for the pastoral areas is harder to explain, but the farms in these areas are large in economic terms and thus capable of further aggregation.




| | 1991 | 1996 | 2001 | 2006 | 2011 | 2016 | 2021 | 2026 | 2031 |
|---|---|---|---|---|---|---|---|---|---|
| Pastoral | 143 | 103 | 100 | 74 | 57 | 45 | 37 | 31 | 27 |
| Northern mixed | 121 | 84 | 100 | 69 | 49 | 37 | 30 | 26 | 25 |
| Southern mixed | 120 | 89 | 100 | 73 | 56 | 44 | 36 | 31 | 28 |
| Southern hills | 125 | 99 | 100 | 78 | 64 | 55 | 49 | 46 | 44 |
| Southern plains | 112 | 104 | 100 | 91 | 86 | 82 | 81 | 81 | 83 |
| Highest rainfall | 95 | 76 | 100 | 78 | 64 | 57 | 51 | 47 | 44 |
| Tablelands | 101 | 84 | 100 | 81 | 70 | 61 | 57 | 54 | 54 |

Figure 38 Projected sheep and sheep-beef farmer population by region

The median age of sheep and sheep-beef farmers is projected to rise substantially in most regions, but again there is variation between regions (Figure 39). Most spectacularly, the median age in the Southern hills region is projected to increase in a straight line and not slow down at all, reaching 72 years in 2031. This is the region with the most desirable landscape amenity characteristics and is thus the most appealing to those who wish to retire into sheep farming, whether as a lifestyle choice or because of a felt need to get into sheep farming. The one exception to the trend of increasing median age, the highest rainfall region, contains the fewest sheep and sheep-beef farmers and is the least stable of all the modelled regions. Although the projections show the median age in this region will decrease slightly, the model is sensitive to the very small number of young farmers in the region and small changes to the data result in much larger changes to the projection. Of all the other regions, about which I have greater confidence in the modelling, the pastoral region remains the one with the lowest median age.

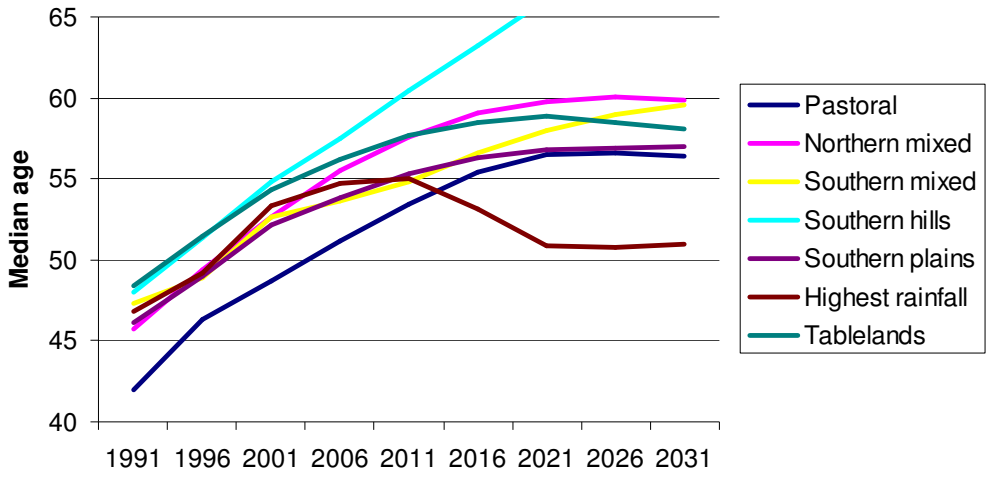



Figure 39 Projected median age of sheep and sheep-beef farmers by region

Projected differences in median age are clearly explained by examining the projected age structure in 2031 (Figure 40). The extremely high median age of sheep and sheep-beef farmers in the Southern hills region results from a massive proportion of them being aged 80 or older. The regions with the next oldest projected median age, the two mixed farming regions, also have a high proportion of sheep and sheep-beef farmers aged 80 and over. All the other regions have a similar age profile. The one exception, the Highest rainfall area, shows a relatively high proportion of young farmers aged 30 or less, but as the model for this region is sensitive to low numbers of young farmers, these figures are probably spurious.

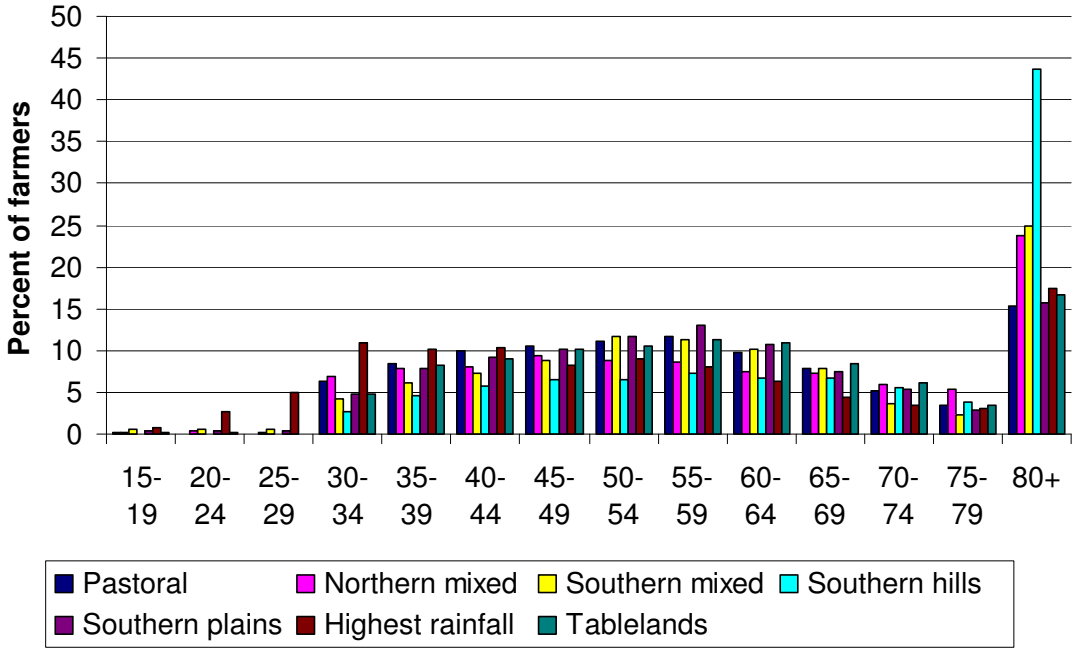



Figure 40 Projected sheep and sheep-beef farmer age structure of regions, 2031

Combining the projected sheep and sheep-beef farmer population change with the projected change in median age in the various regions shows divergent demographic trends between the regions (Figure 41). Most strikingly, the pastoral region and the two mixed farming regions share a remarkably similar demographic future, where they are projected to lose three-quarters of their sheep and sheep-beef farmers and face a moderate increase in median age. In contrast, the four high-rainfall regions vary greatly in their projected demographic future. The Southern plains region is projected to retain 80 per cent of its sheep and sheep-beef farmer population, with the median age increasing by 5 years. The Tablelands region is also likely to have a modest increase in median age (4 years) but loses almost half of its sheep and sheep-beef farmer population. These two regions have the most and second most sheep and sheep-beef farmers of all the regions, and they are projected to remain the two most populous regions. Between them they currently account for about 40 per cent of Australia's sheep and sheep-beef farmers, and this figure is projected to rise to about 60 per cent. These two regions, with their large, viable farms, generally low landscape amenity (particularly on the plains), and lack of viable, large-scale alternative enterprises, as likely to remain Australia's main centres of sheep production in the future. The Southern hills region is projected to lose slightly more than half its sheep and sheep-beef farmers, but their median age is likely to rise dramatically. The Highest rainfall region also loses slightly more than half its sheep and sheep-beef farmers, but with little change to their median age. Both these regions have high amenity value, but the Highest rainfall region has a wider range of alternative mainstream agricultural land uses that give young farmers a commercially viable future, in particular dairying. The major mainstream agricultural alternative to sheep in the Southern hills, beef cattle, is very much a retirement activity and it appears that sheep farming in this region has a similar future.

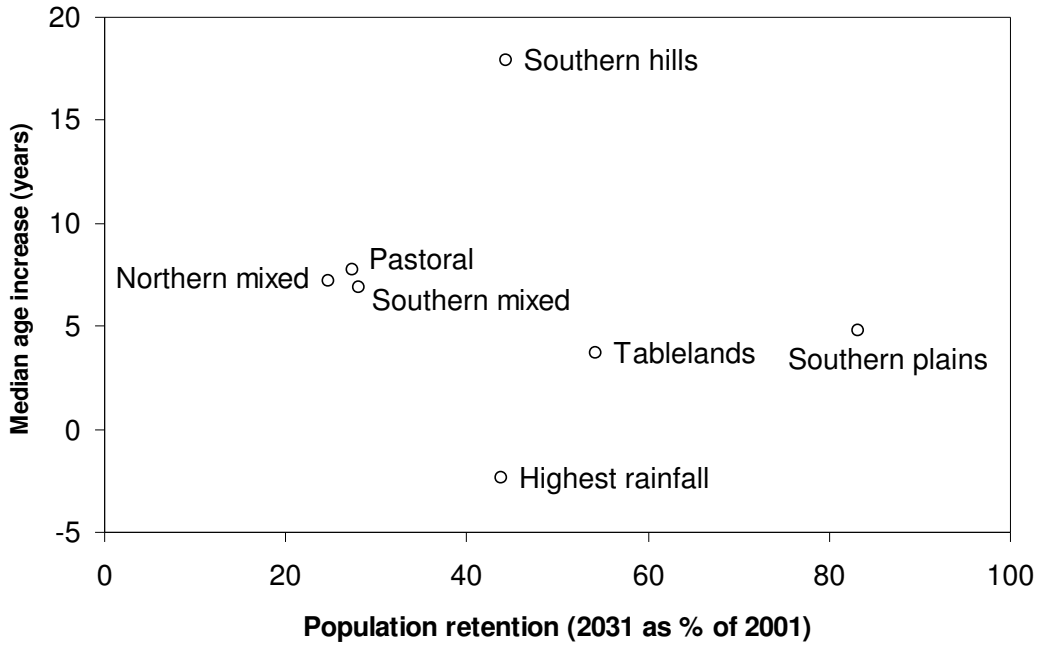



Figure 41 Projected median age and population retention of regions, 2031

# 6 The likely demographic future of Australian sheep farming

## 6.1 Regional futures

There is likely to be a very different set of futures for sheep farming in Australia's different agronomic zones. Currently two-thirds of Australia's sheep farmers are in the high rainfall zone and only one-third in the wheat-sheep and pastoral zones. Over the next 30 years, the proportion in the wheat-sheep and pastoral zones is projected to halve, while the proportion in the high rainfall zone will climb to over 80 per cent.

The mixed cropping areas are the most susceptible to churning of enterprises, as farmers continually re-evaluate their enterprise mix to make the most of changing market and seasonal conditions. It is not clear whether those who leave sheep farming will be staying in farming but just changing their enterprise mix, or getting out of farming altogether. Given the mixed nature of much of the farming in these areas, it seems likely that many will be simply changing enterprise. Just as it is easy to get out of sheep in the mixed cropping areas when the markets for wool and lambs are not good, it is equally easy to get back in when the markets improve. But if the infrastructure needed to run sheep (fences, water supply, sheepyards, shearing shed) is allowed to run down it will be more difficult for a cropping farmer to get back into sheep. And if a farmer's cropping regime evolves to the point where the seasonal demand of sheep for feed or labour do not fit well with the needs of the cropping program, the chance of sheep returning to a formerly 'mixed' cropping farm will reduce. I know a farmer in the Victorian Mallee who has an air-conditioned shearing shed (he used to shear in February and shearers would queue up to work there!). He found that, for his sheep enterprise to be profitable, the peak feed demand would fall at a time when feed was not available. If he changed his lambing time so that feed would be available, he would be selling his lambs at a time when prices were low and the enterprise would be unprofitable. The air-conditioned shearing shed now lays idle. This is a farmer who has demonstrated some dedication to sheep farming but who will require more than simply better prices for lambs and wool before he returns to the sheep industry.

Although the pastoral zone is projected to retain fewer than half of its farmers, if the farms amalgamate in the same way as they have in the past the amount of wool grown in the zone may not change greatly. As the cost-price squeeze forces increasing efficiency, and as increasing efficiency is usually obtained by increased scale, pastoral farms are likely to get larger and the pastoral areas will require fewer farmers to run the same number of sheep. It will be able to provide jobs for fewer sheep farmers.

The pastoral zone and the mixed cropping areas are generally low in amenity. They are often far from the social, cultural, recreational, educational and health-care amenities of large towns and cities, and in landscapes that seem to be appreciated only by those whose families have lived in them for several generations. Because of their low amenity, the only real competition for extra land comes from other farmers. Compared with high amenity areas, land prices remain low relative to their productive value, and farmers can afford to expand. These areas do offer a future for commercial sheep farming.

The high rainfall areas, where landscape and social amenity is concentrated, will retain many of their sheep farmers. A higher proportion of sheep farmers in the high rainfall zone does not necessarily mean a higher proportion of wool gown or lambs produced there. If lifestyle farmers are generally likely to have smaller farms than commercial farmers, it will require more of them to produce the same amount of wool or meat. Thus, even though the weight of numbers of sheep farmers may come to rest in the high rainfall zone, the weight of numbers of sheep between climatic zones may not vary much at all. And if amenity or lifestyle sheep production becomes concentrated in the high rainfall zone, then the way sheep are produced in that zone may change. A lifestyle farmer may or may not even want to run sheep. Their decision is likely to be based on lifestyle and identity needs rather than the relative profitability of sheep farming versus other agricultural land uses.

Lifestyle pressures affect the high rainfall zone much more than the wheat-sheep or pastoral zones, but they do not affect all parts of the high rainfall zone equally. Only some parts of the high rainfall zone are near Sydney or Melbourne, close to major highways, along the spine of the Great Dividing Range, near water bodies or close to large towns. Even within the regions I have modelled there will be variation. The Southern Plains region, in particular, encompasses a wide variety of country with different social appeal, from the Western District of Victoria and the south east of South Australia, to the Tasmanian midlands, to Kangaroo Island and Adelaide's playground Fleurieu Peninsula. Because landscape amenity (and thus lifestyle demand) is not equally spread, some parts of the high rainfall zone are likely to remain in commercial sheep farming to a greater extent than other parts. The high rainfall areas most likely to remain are those that are relatively isolated, such as the south east of South Australia, the Western District Plains and areas west of the Grampians in Victoria, and the Northern Tablelands and Monaro of New South Wales.

The projected demographic structures in the various regions describe the likely number of sheep farmers and their age structure, but say nothing about the size of the farms or the range of farm sizes. Nor do they say anything about what kind of farmers manage what kind of farms. We know that, for many of the people who manage small sheep farms, managing the farm is their major occupation. We don't know why those farms are small, whether it is from economic necessity or lifestyle choice. We don't know what other income these farmers have, whether they are reliant on the farm and are making do with a very low income, or whether they have substantial off-farm income that does not require a majority of their time to earn. We don't even know how old the managers are. To find out information like this would require linking AAC data on the production of an agricultural establishment with corresponding CPH data for the demographic characteristics of the household, family or individual that manages or works on that establishment. It is possible to link the two types of data sets in some other countries, notably Canada and Israel, but not in Australia. Our research group has made representations to ABS about linking data from the two kinds of census but it appears unlikely that it will be done.

How big a sheep farm is big enough? Of course it depends, and not only on climate and soil type. It depends also on what you want from your farm. Someone who is trying to be a full-time, commercial farmer obviously needs a farm that is large enough to be viable as a business. But a lifestyle farmer, who has a low need for income in retirement or who has a source of income from elsewhere, may not need so large a farm at all. Their main requirement may be that the farm is large enough, and sufficiently like their idealised view of what a farm should be like, to allow them to project to themselves and others their identity as a farmer. If you have sufficient capital that the size of your farm is not critical, you may as well pay the extra to buy an attractive one in a high amenity area.

## 6.2 Disappearance of the young sheep farmer

The main factor driving the increasing average age of the sheep farming population is the declining rate of entry of younger people to the occupation. Entry by people under 25 years of age is now relatively uncommon, and projections are for the number of sheep farmers under 30 to reduce almost to zero. Young people, even those raised on farms, are choosing to go farming in fewer and fewer numbers, and this is particularly true of the sheep industry. Their reasons relate not just to the low returns that many children of sheep farmers will have observed as they were growing up in the early 1990s, but to the distasteful work of crutching and dagging sheep and the distance from amenities. Cafes, cultural pursuits, good universities, well paid jobs with a salary paid into your bank account every fortnight, friends and potential wives are all to be found in the distant city and not the local town. A trend as strong as this will not be reversed merely by a return to higher farm product prices. For young people, career and lifestyle opportunities in the city are much greater and more enticing than for their parents.

Just as many young people are leaving the farm, many middle aged or older people are returning. Today, mid-life entry, often after a significant non-farm career, has become common. Whilst some entrants are following a passion for sheep farming by independent purchase of a sheep property, others are rescuing

the family farm as their parents age and can no longer cope. It is not easy to tell whether or not, in a given family, this form of inter-generational transfer will occur. Sometimes children who have settled in the city with professional jobs and have said all their adult lives that they will never return to the farm, actually do so when their ageing parents die or announce that the family farm will be sold. And, even if this does not actually happen, some parents harbour a wish that it will (Vanclay 2004).

A related phenomenon has been observed in Scotland, in which rural migrants return to the land of their youth in later stages of their working life (Stockdale 2002). It is likely to occur in Australia and will increase in importance. This return of the middle-aged to the farmland of their youth will often be part of the wave of wider amenity migration, rather than a decision based upon the opportunities offered by the family farm. Many of the returning children will have no need to rely on the farm for much of their income. If they choose to remain in sheep farming, it may not be in a major way. Such returns to rural areas will be more likely in closer-settled and high-amenity agricultural regions. In these areas, these changes have the potential to create patterns of farm gentrification. In other, less attractive, regions the young will not return in large numbers and population decline will accelerate.

Structural adjustment is a necessary component of any agricultural industry faced with a cost-price squeeze. Although good for the viability of the industry as a whole, adjustment imposes social costs on individuals and families faced with their own adjustment decision. Such costs are greatest for older farmers who are forced out of the industry by economic pressures. The form of adjustment that imposes the least social cost and causes the least dislocation is probably the decision made by fewer young people to enter the industry. This is the adjustment that is occurring in the Australian sheep industry.

How realistic is the projection that sheep farmers aged under 30 will virtually disappear by 2011? The trend has been happening since 1986. From 1976 to 1986 the proportion of these young sheep farmers was stable at 13 or 14 per cent of the total. Between 1986 and 2001 the proportion of young sheep farmers dropped from 14 to 5 per cent. The model simply extrapolates that trend, and projects that by 2011 the proportion will drop to 1 per cent. The trend is not new, nor it is unique to Australia or even the sheep industry: it has been observed all over the world, all over agriculture, for generations, as this quote from the United States in 1914 shows:

> 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 10 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)

Is the disappearance of the young sheep farmer a problem? Does the sheep industry need more young farmers? If a young entrant to sheep farming is to make a reasonable living from it, their farm needs to be large. Because of the cost-price squeeze, the minimum size for a viable farm keeps increasing. There are many small sheep farms in Australia: the financially smallest 40 per cent of them produce only 10 per cent of the total value of production, while the largest 10 per cent produce 40 per cent of the value of production. For a young person growing up on a small sheep farm, even if their parents had been satisfied with the living to be made from it, any expectation that they could build a career based on that farm would be unrealistic. The struggle to make ends meet on an unviable sheep farm is likely to be unrewarding for them and a move to town a better use of their talent and enthusiasm. For the relatively small number of children from large sheep farms there is indeed the potential of a career on the farm. An industry with shrinking labour requirements needs increasingly fewer entrants to maintain itself anyway. For those children from small sheep farms who still want to be involved in the industry, their best option is likely to be to build an another career off the farm, then take up farming once their financial security has been

assured by their other career. Even if they get into sheep farming at an older age than did their parents, the increasing number of ageing sheep farmers indicates that they might still be able to have a long career in the sheep industry.

## 6.3 Rise of the ageing sheep farmer

The age at which farmers retire from the sheep industry is rising. Farmers, being for the most part self-employed, have no mandated retirement age. But 'retirement' has several meanings for farmers: there is retirement *from* farming, retirement *in* farming, and retirement *to* farming (Foskey 2001).

Retirement from farming used to involve passing management of the farm to a child. The baby-boomers generally took over management of their farms in an orderly transition from their fathers. Their fathers retired *from* farming. Given the reducing attractiveness of the farm lifestyle to many young rural people, fewer and fewer of the current generation of ageing sheep farmers will enjoy the luxury of handing on their farm to their children. For them, retirement *from* farming will require the sale of the farm, something that is, for many, unpalatable. Many sheep farmers know nothing else but farm work, their whole identity is around being a farmer. For them, life without farming is life without identity, and they are frightened of dying if they retired. For farmers without off-farm interests or hobbies, the only reason for slowing down is decreased physical capacity to work. The one thing that makes retirement socially acceptable to sheep farmers, a child wanting to take over the farm, is denied them. So they choose to retire *in* farming.

Reduced inter-generational transfer is one reason why the age at which sheep farmers retire appears to be rising. Another is the proliferation of labour-saving tools such as 4-wheel farm 'bikes', which have been praised by some ageing sheep farmers I know for allowing them to retain enough mobility to keep working. Another boon for ageing sheep farmers is the hydraulic wool press. Not only has it provided cost savings through enabling heavier bales to be pressed, but it also makes pressing wool easy for older farmers. Eventually, failing health and mobility will force these sheep farmers to retire.

Then there are those who retire *to* farming. The rapid increase in the median age of sheep and sheep-beef farmers since 1991, which is projected to continue until about 2021, is probably associated with the behaviour of baby boomers, born between 1946 and 1950. Since 1986, throughout almost all of their working life, they have formed the most populous 5-year age cohort. Adding to this 'installed base' of baby-boomer commercial sheep and sheep-beef farmers over the next few years will be other baby-boomers retiring to sheep farming from careers in other occupations. In 2001, members of this cohort were aged between 50 and 54, nearing the age of early retirement cherished by many people in sedentary, office-bound occupations. In 2021 they will be aged between 70 and 74, an age at which many current sheep farmers are still working hard, actively managing their farms. While many lifetime commercial sheep farmers in this cohort may well have retired by then, many of those who had retired to sheep or sheep-beef farming may not be ready to leave their farms. Some of them are likely to be 'frustrated farmers' who pursued a career in another occupation while harbouring a desire to go farming. The cost-price squeeze leaves room for fewer and fewer farmers every year but, while it provides an economic incentive for farmers (and particularly their children) to leave the land, it does not necessarily remove the emotional attachment to the land. These retirement farmers are unlikely to give up their farms easily. Improvements in life expectancy and labour-saving devices will allow them to keep farming for longer, if that is their wish.

How realistic is the projection of such a high proportion of farmers aged 80 and over, making them the most populous age cohort of all in every region? The signs are already apparent, in a lowered exit rate and steady entry rate among older farmers, and the model is simply extrapolating the current trend by projecting it forward. Human life expectancy is certainly increasing, with the median age at death in Australia in 2003 being 79 years, an increase of 6 years since 1983 (ABS 2004). By definition, half of all deaths involve persons older than that. If the median age at death keeps rising at the same rate then there is indeed likely to be a substantially increased pool of people aged over 80 who are capable of managing a

sheep farm in 2031. Two examples come to mind. One is my own father who, aged 82, is still running his sheep farm (although now at a reduced acreage) and has only just told me that he thinks he is not as strong as he was and is finding it harder to shear a sheep. The other, Bert Farquhar, is better known. In 1986, at the age of 68, he paid more than $10 million (at the time an Australian record price for a single farm) for Rushy Lagoon, a very large property at the north east tip of Tasmania. He then embarked on a major irrigation and development program that at one stage he calculated would take until he was 93 to complete. But with the accidental death of his son the impetus to develop the large property was lost and he sold it (Grant 2004). Are these two people exceptional? Maybe now, but perhaps not in the future.

Bert Farquhar's example, in selling the farm after the death of his son, shows the importance of the existence of a successor in determining the occupational future of older farmers. The presence of a successor drives some farmers to stay on their farms, because they see the future of their farm being realised through their successor. Eventually they plan to hand over to the successor, and the farm will not be sold. In contrast, for some other families, it is the absence of a successor that drives them to stay on their farms. Older farmers whose children have decided not to enter farming as a career do not have an incentive to step aside from the farm to allow their children to take over its management. Their easiest course of action is to remain in farming for as long as they are healthy and able to enjoy it. Once these parents have accepted the reality of their children not coming home on the farm, they can make the decision to sell the farm. Having made that decision, they may well keep farming for some years before retiring and selling it. So the impact of a decision to sell the farm may not be realised until many years after it has been made.

## 6.4 Sheep farming as a business, a lifestyle or both

Is farming a business, undertaken for commercial purposes, or a lifestyle, undertaken for amenity purposes? Commercial farming is susceptible to both economic adjustment pressures and lifestyle pressures. For people whose farm is their main source of income, the relentless requirement for increased efficiency or scale forces amalgamation of commercial farms. The number of commercial farmers decreases continually. Farmers are renowned for their ability to 'tighten their belts', reducing expenditure when times are tough. Some take another job to get through the tough times. This is why the amount of adjustment out of agriculture by less efficient or smaller scale farmers is generally less than that predicted by economic policy analysis. The effect of lifestyle pressure on adjustment of commercial sheep farmers is generally felt in a decrease in inter-generational transfer. The children of sheep farmers see improved lifestyle opportunities in the city, often allied with improved economic opportunities. Seeing no better alternative use of their time and energy, their parents often remain on the farm.

In contrast to commercial farming, lifestyle or amenity farming is less much susceptible to economic pressures. It is, however, more susceptible to lifestyle pressures. One can afford to be a lifestyle farmer only if one has another source of income. The cost-price squeeze means a lot less to these farmers than it does to commercial farmers. Their need for belt-tightening is related more to the fortunes of their other source of income than it is to their source of farming income. Lifestyle pressures, related to distance from their other source of income or their stage in the family life cycle, do affect their decisions about whether or not to move out of farming. This results in a greater degree of turnover of lifestyle properties than commercial farms. Because these farms are well developed with infrastructure, and even their land component is priced out of the reach of commercial farmers, they are likely to be purchased by people wishing to enter lifestyle or amenity farming. The result is frequent turnover or churning of lifestyle properties, rather than the amalgamation of properties that would be expected in areas where commercial sheep farming is still a proposition.

The word 'lifestyle' means different things to different people. For a young person raised on a farm, a better lifestyle is one that provides social, recreational, educational and cultural opportunities, none of which farms are renowned for. Young people tend to move to the city for lifestyle reasons. For someone older, who has become disillusioned with the fast pace, competitiveness and claustrophobia of the city, a

better lifestyle may be instead one that offers space, peacefulness and an absence of rapacious bosses. They move to the farm for lifestyle reasons. The same person might move in completely different directions at different stages of their life, and both moves can be made for lifestyle reasons. One vision of lifestyle drives the young off the farm and into the city; another vision of lifestyle may drive that person, once they are older, out of the city and back to the farm.

The variation in projections of regional futures, particularly between the various high rainfall regions, suggests a divergence in paths. In some areas, sheep farming may become more of a business. Bryant (1999) has described a shift in some farmers' belief structures from a view of oneself as a farmer towards a more urban occupational identity. Some farm managers are increasingly likely to see themselves less as a farmer than as a manager with skills that have much in common with the skills of other business managers outside agriculture. Bryant has also described what she has called "the centrality of the market in constructing the self", where increasing numbers of farmers come to consider their value in terms of strategic decision making on the farm, rather than their ability to undertake physical labour in an outdoor setting. If, for some, sheep farming becomes not a way of life but a managerial job like any other, then the pattern of farm exit decisions made by Australian sheep farmers may change. Some sheep farmers will come to assess the rewards of their current job by comparing them with what is on offer elsewhere. For these commercially oriented sheep producers, farming loses its exceptionalism, its special lifestyle and essential difference from other occupations.

In other areas sheep farming may become more of a lifestyle, catering to the rural amenity needs of new residents, who may be urban refugee settlers or people who have retired to sheep farming. These areas will retain some existing farmers, many of whom will have been farmers all their lives and know nothing else but farm work. For people such as these, their identity centres on being a farmer rather than making a profit by farming, and they maintain this identity and the lifestyle that goes with it despite increasingly low returns. Not only do amenity, lifestyle and 'way of life' farmers have limited ability to respond to market signals because of the small scale of their farms, but also they are not motivated strongly by financial considerations anyway.

At the moment sheep farming is both a business and a lifestyle for most sheep farmers. For many it even goes beyond those labels to be a calling. In the same way that many pilots feel a visceral and unexplainable compulsion to fly, many farmers feel compelled to farm. It is all they have ever wanted to do. They are not doing it for money, and in many cases put up with low returns or low wages. The idea of considering any other job does not hold meaning for them, because farming is not just a job, nor is it just a lifestyle. It is such an integral part of them that to question it is to not understand it. In future such a personal identity may become a luxury few sheep farmers can afford. They will have to choose between business and lifestyle, and to have one will mean letting go of the other.

# Acknowledgments

This report is one in a long line of reports on the changing demographic structure of Australian agriculture produced by our research group. Each report has provided new knowledge of farm demographics and how to analyse them, but each depends utterly on advances made in previous reports. Each has required the solution of specific problems, but none of them could have been produced in isolation. My name might be the only one on the cover of this report, but behind the whole report lies the hand of Neil Barr, who pioneered many of the analytical techniques used here. Many times I discussed analytical nuances, possible interpretations, and potential means of calming seemingly errant data with him. Komala Karunaratne has also been involved in many aspects of the demographic research program. I have had other helpers too. Discussions with several leading sheep farmers and sheep industry professionals as well as colleagues in my own department and other similar departments around Australia have helped me to better understand the nature of Australian sheep farming. I would also like to thank my father, David Wilkinson, for imbuing me with a love of sheep and showing me by his example some of the different ways in which one can be a sheep farmer.

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# Appendix: detailed description of model

The modelling methodology follows that which was developed and applied in (Barr 2004a; Barr 2004a).

We 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 showed 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 to 39 in 1996 will have similar exit patterns in 2006 to that displayed by farmers aged 45–49 in that same region in 1996 assuming similar commodity price and seasonal conditions (Tolley and Hjort 1963), (Kanel 1964) (Smith 1987), (Gale 1996), (Gale 2003).

## Entity structures: farms and farmers

Enumeration of the structure of the farm sector or a single industry within it 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 is portrayed in Figure 42.

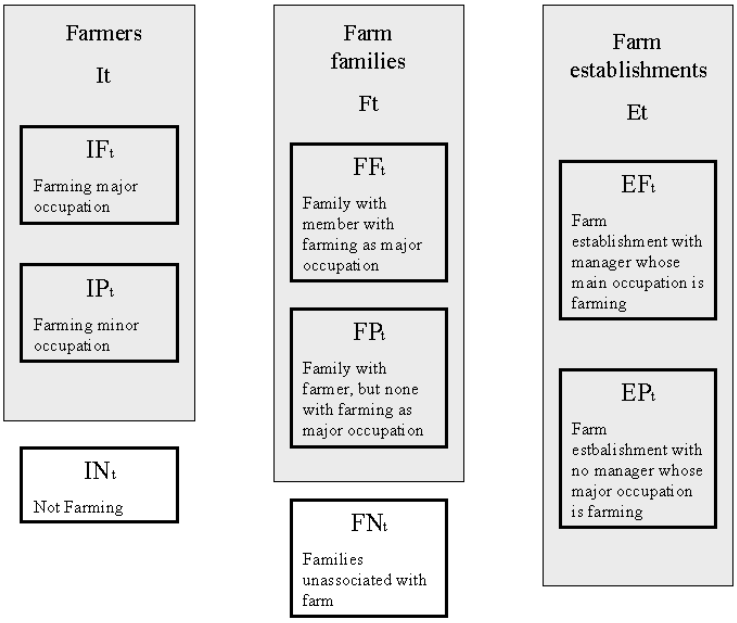


Figure 42 Entity structure of Australian farming

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

- **IFt** 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.
- **FFt** 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.
- **Et** A count of farm establishments derived from the AAS. This count has been available from all AAC years. The Australian Bureau of Statistics uses the data collected within its Farm Census to create a measure of farm size called Estimated Value of Agricultural Operations (EVAO).
- **EFt** 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 Population and Housing Census. 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.
- **EPt** 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.

- **IPt** This is a count of persons operating a farm who nominate an occupation other than agriculture as their main occupation.
- **It** This is the count of all individuals having farming as either a minor or major occupation.
- **FPt** 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.
- **Ft** 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:

$$\mathbf{It = Ift + Ipt} \quad - (1)$$

$$\mathbf{Ft = FFt + FPt} \quad - (2)$$

$$\mathbf{Et = EFt + EPt} \quad - (3)$$

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.

$$\mathbf{It \geq Ft} \quad - (4)$$

$$\mathbf{IFt \geq FFt} \quad - (5)$$

Establishments with at least one person whose major occupation is farming can be associated with more than one farming family. 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.

$$\mathbf{FFt \geq EFt} \quad - (6)$$

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 IPt. 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 IPt can be based upon a very simple assumption:

$$\mathbf{IPt \approx FPt \approx EPt} \quad \text{- (7)}$$

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 inter-censal period.

## 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 43.

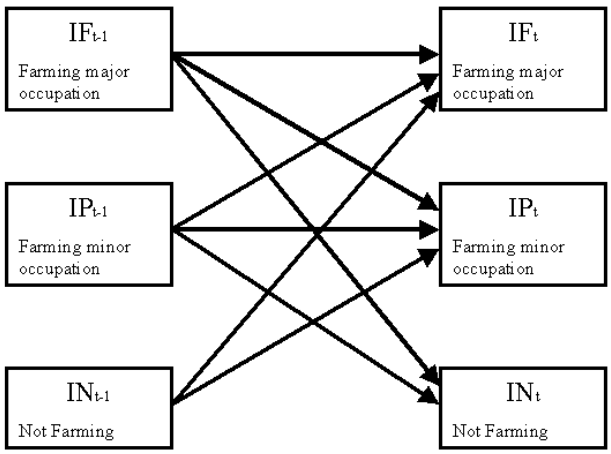


Figure 43 Conceptual model of agricultural adjustment using farmer entity

This model can be broken down into components to represent each of the inter-censal 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 IPFt 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:

$$\mathbf{IFt = IFFt + IPFt + INFt} \quad \text{- (11)}$$

There are another five of these equations.

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 44). 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 occupational to farming as a minor occupation status in the same aggregate measure of exit from farming;

$$\mathbf{Exit(t\text{-}1,t) = IFPt + IFNt}$$

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

$$\mathbf{New(t\text{-}1,t) = IPFt + INFt}$$

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

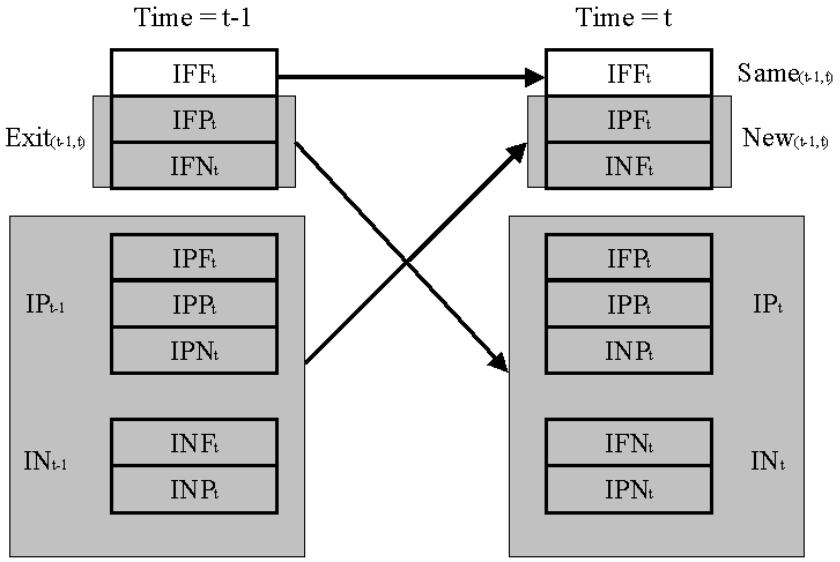


Figure 44 Simplified conceptual model of change

This simple model can be operationalised by using historical 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*.

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

where *k* is estimated from previous inter-censal periods.

The value of new can be estimated as a function of the number of exits in the inter-censal period. The greater the number of exits, the greater the opportunity for others to enter agriculture.

$$\mathbf{New(t\text{-}1,t) = } j \mathbf{\ Exit(t\text{-}1,t)}$$

where $j$ is estimated from previous inter-censal periods.

Estimation of Same(t-1,t) is trivial.

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

This simple model overlooks the very strong relation between entry and exit behaviour and age . The model can be enhanced by creating stock variables for each 5-year age cohort between 15 and 80 and a stock variable for farmers aged 80 years and over. This enhanced model is represented in Figure 31.