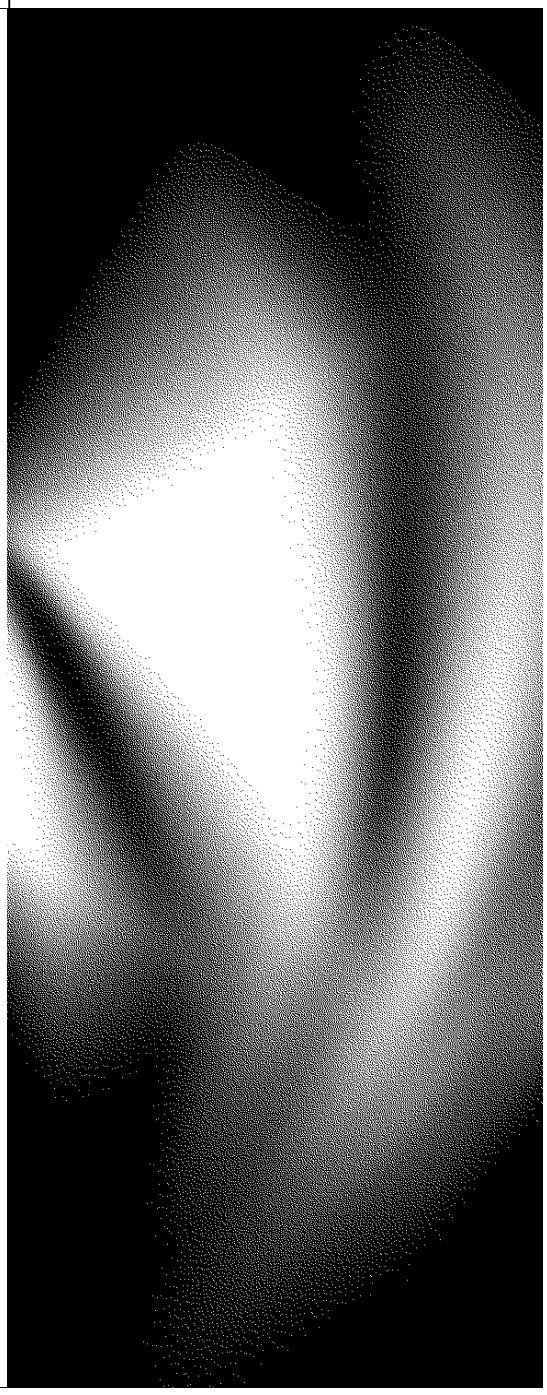
PRODUCTIVITY COMMISSION

Battery Eggs Sale and Production in the ACT

Research Report



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Foreword

This report has been prepared for the ACT Government. It follows a request to the Commonwealth Treasurer that the Commission undertake public benefit tests on ACT legislation banning the production and sale of battery eggs and requiring specific labelling of eggs. These tests are required under the Competition Principles Agreement for any legislation that restricts competition.

Public benefit tests require an assessment of all the costs and benefits of a regulation. In the case of battery hen regulation in the ACT, the costs largely stem from higher egg prices for ACT consumers and the costs of adjustment in production, both of which can be quantified. The benefits are much more complex, however, as they relate to expected changes in hen welfare and the effect of such changes on the wider community.

This report investigates these matters in detail, drawing on a wide literature and extensive public consultations, and provides a framework for assessing whether the benefits exceed the costs. It does not, however, attempt an overall judgment on this matter, given the inherent subjectivity and ethical considerations in some elements of the benefit calculation. These will ultimately require an exercise of judgment by the ACT community's elected representatives.

The Commission would like to thank all of those organisations and individuals who contributed to the study.

Gary Banks
Chairman
October 1998

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Main abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AEIA	Australian Egg Industry Association
ANZFS	Australian & New Zealand Federation of Animal Societies
CPA	Competition Principles Agreement
DPIT	Department of Primary Industry (Tasmania)
EU	European Union
IC	Industry Commission
NFA	NSW Farmers' Association
NRAAVC	National Registration Authority for Agricultural and Veterinary Chemicals
MRA	Mutual Recognition Act
ORR	Office of Regulation Review
R & D	Research & Development
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SVC	(EU) Scientific Veterinary Committee
TTMRA	Trans-Tasman Mutual Recognition Arrangement
UK	United Kingdom

Summary

In September 1997, the ACT Legislative Assembly passed legislation to:

- ban the production and sale in the ACT of eggs produced by hens housed in battery cages; and
- require the labelling of egg cartons sold in the ACT to indicate the production system used to produce the eggs.

One effect of the legislation would be to restrict competition in the supply of eggs to the ACT. This triggers the Competition Principles Agreement, which requires governments to undertake public benefit tests of legislation which restricts competition, to assess whether the community benefits associated with the restrictions outweigh the costs.

This study follows the Treasurer's agreement to an ACT Government request that the Commission carry out these public benefit tests on its behalf.

The framework for undertaking public benefit tests requires that all relevant factors — not just *economic* benefits and costs — be taken into account. This is important because the proposed ACT ban on battery eggs involves consideration of ethical issues associated with the welfare of layer hens.

Hen welfare

Governments throughout Australia (and elsewhere) commonly use legislation to prescribe minimum standards of animal care. Such legislation is often generic in character. However, animal welfare concerns arising in particular industries are often addressed in codes of practice developed jointly by government and the industry.

Animal-specific legislation to ban particular animal housing or husbandry practices is less common. In the context of layer hens, a number of European countries have recently contemplated, or are presently considering, banning the use of battery cage systems. One country — Switzerland — has already effectively banned battery egg production.

Assessing the animal welfare effects of different egg production systems is far more difficult than is popularly conceived. For instance, *all* commercial systems — not just battery cage systems — have some adverse welfare effects (eg beak trimming is common to all systems, as is the practice of disposing of birds at around 72 weeks of age). A number of other factors add to the complexity of the task, leading to very different views about the *overall* effect on hen welfare of the three major egg production systems (battery cage, barn-lay and free-range).

It is clear that different egg production systems have a variety of subtle and complex influences on the physical and behavioural aspects of hen welfare. It is also evident that one key determinant of animal welfare is not related to the housing system at all, but to the standards of animal husbandry practised by farm managers. Some of the major advantages and disadvantages for hen welfare of the battery cage system and its main commercial alternative — the barn-lay system — are shown in the box below.

Animal welfare: battery cage and barn-lay systems

	Main advantages	***Main disadvantages***
Battery cage	• Relatively low mortality • Cannibalism and sickness is relatively low • Better environment in terms of temperature control and low dust levels	• Space restrictions prevent expression of natural behaviours such as dust bathing, perching, nesting, wing stretching and exercising • Feather pecking and fracture rates are relatively high
Barn-lay	• Space and facilities to allow exercise and natural behaviours that are not possible in cages	• Mortality is higher than in cages, in part reflecting higher levels of cannibalism and disease • Higher skill level needed for good husbandry

In assessing hen welfare, the Commission has drawn on international and Australian studies and on information provided by participants in this study. This evidence suggests that, on balance, a move away from the use of battery cage systems would lead to some improvement in hen welfare, particularly in the longer term (chapter 4). This mainly reflects the fact that alternative systems allow greater expression of behaviours which experts in the field agree are important to hens — such as dust bathing, nesting and perching.

Economic costs

The economic costs of the ban would largely be reflected in higher egg prices faced by households that presently buy battery eggs. Consumers of goods produced in the ACT that use fresh shell eggs (such as restaurants and fast food outlets) would also experience small price increases.

The annual costs to consumers of these increases is estimated to peak at about $900 000 in the year after the ban, and then fall steadily in subsequent years. Initially, this implies an increase in retail egg prices of around $0.40 per dozen. The annual savings (the perpetuity) needed to pay for these price increases is estimated to be around $650 000 (commencing in 2005–06 — the likely year when the ban would be implemented) (chapter 6). This estimate reflects a number of assumptions including:

- an increase in the supply of eggs produced in barn-lay systems, but not necessarily in systems identical to those that presently meet RSPCA standards;
- a fall in the price differential between battery eggs and other eggs;
- a decrease in the retail margin on barn-lay eggs as they become the predominant type of egg consumed in the ACT after the ban comes into effect;
- the maintenance of the current trend in consumer preferences towards non-battery eggs; and
- a continuation of the present fall in per capita egg consumption.

Other significant costs are one-off adjustment costs experienced by producers (including the premature retirement of productive assets) and employees. These costs depend largely on:

- the present value of the assets specific to battery egg production of Barrter Parkwood — the predominant producer in the ACT;
- whether or not these assets could be used elsewhere; and
- the extent, if any, of future activity at the Parkwood site.

Based on Barrter's statement that it would cease business in the ACT and independent asset valuations provided by the company, the adjustment costs are estimated to be no more than $4.4 million. The annual perpetuity needed to meet this cost is around $290 000 (chapter 5).

To the extent that there is surplus capacity in the industry, the early retirement of Parkwood's assets could lead to the use of otherwise unused (or under-utilised)

capacity elsewhere in the industry. In this circumstance, the adjustment costs — from the community's viewpoint — would be less.

Implementation of the ban and the labelling requirement would increase ACT Government administration and enforcement costs (chapter 7). Some would be 'one-off' establishment costs (eg creating the prescribed expressions for egg cartons). Some costs will be on-going (eg measures to limit the scope for battery eggs to be misrepresented as barn-lay or free-range eggs). However, administration and enforcement costs would be small relative to the consumer and adjustment costs.

Commercial egg production can give rise to adverse environmental, consumer health and occupational health and safety outcomes. However, poor performance in these areas has seldom been a serious problem in the past. The Commission does not consider that the ACT legislative amendments would have any significant effect on the likelihood of these problems occurring in the future.

Overall, the major economic costs are those that would be experienced by consumers and adjustment costs. These are estimated to be equivalent to an annual perpetuity of no more than $940 000.

Weighing up the benefits and costs

The major benefits accruing to the community from the ban are related to the improvement in hen welfare and the lower egg prices that would, in time, be enjoyed by current ACT consumers of barn-lay eggs.

While the available information suggests that, on balance, the ban would make some improvement to hen welfare, the Commission cannot reliably assess in quantitative terms the extent of the associated community benefits. If the benefits are to outweigh the costs, they would need to exceed the cost associated with an annual perpetuity of around $940 000. The Government of the ACT — the residents of which will bear most of the costs stemming from the ban — will have to judge whether the benefits outweigh these costs.

The requirement to label egg cartons to clearly indicate the manner in which the eggs have been produced is more straight-forward. The provision of this additional information could benefit a significant proportion of consumers with little or no addition to producers' costs. The benefits would be larger if the ACT Government were able to obtain an exemption from the Mutual Recognition Act to make it compulsory for interstate producers to label eggs they sell in the ACT.

Alternative action

The Commission examined a number of alternative policy options. None of the alternatives would be likely to achieve the intended objectives of the proposed ban in a cost-effective manner. However, the implementation of the ban will require the unanimous agreement of Heads of Government to an exemption to the Mutual Recognition Act. If this is judged unlikely, the ACT Government should consider the option of improving hen welfare by seeking to better inform ACT consumers about the animal welfare effects of different egg production systems.

As some battery eggs would still be sold in the ACT, this option would reduce the number of hens kept in battery cages (and the accompanying benefits) by a smaller amount than would a ban. However, it would avoid the costs associated with a ban (eg an increase in retail egg prices and the premature retirement of some Parkwood assets). Implementation may also be easier (even though an exemption to the Mutual Recognition Act would still be needed to make this option fully effective) (chapter 8).

Key findings

1. The ACT legislative amendments would lead to some improvement in layer hen welfare, particularly in the longer term. The extent of the improvement, and the benefits that would be derived by the ACT community and other Australians, are not amenable to reliable measurement. This, in part, reflects the fact that the proposed ban on battery eggs raises ethical, as well as economic issues.

2. The implementation of a ban on the production and sale of battery hen eggs in the ACT would give rise to two significant economic costs:

- costs borne by consumers because of higher egg prices are estimated to be the equivalent of an annual perpetuity of about $650 000; and
- adjustment costs resulting from the premature retirement of productive assets are estimated to be the equivalent of an annual perpetuity of no more than $290 000.

There would also be a minor increase in ACT Government administration and enforcement costs.

3. The ban on battery hen eggs could result in the closure of the major egg producer in the ACT and an increase in egg production in New South Wales. This would be reflected in higher employment in the New South Wales egg industry and a fall in the ACT. Overall, there could be a small increase in aggregate employment in the industry because of the higher labour intensity of alternative egg production systems compared with battery cage systems.

4. Any consumer health, environmental or occupational health and safety effects stemming from the ban would be negligible.

5. As most of the costs are borne by the ACT, it is appropriate for the ACT Government to judge whether the community benefits from banning the production and sale of battery eggs outweigh the costs. The benefits associated with the restriction to competition resulting from the legislative amendment could be viewed as outweighing the costs if they are assessed to exceed the cost of an annual perpetuity of approximately $940 000.

6. Many consumers have a poor understanding of the animal welfare implications of the different egg production systems. Labelling of egg cartons to indicate the manner in which the eggs have been produced would benefit some of these consumers. The extent of this benefit cannot be quantified. However, the associated costs are likely to be negligible. The Commission considers that the benefits of the legislative amendments relating to labelling outweigh the costs.

The Commission draws attention to its comments on the desirability of the ACT Government:

- pursuing its layer hen welfare objectives by providing consumers with information about the effects of different egg production systems on hen welfare if the granting of an exemption to the Commonwealth's *Mutual Recognition Act 1992* for the ban is considered problematic, or if the community benefits of a ban are perceived to be insufficient to outweigh the estimated costs (chapter 8);
- if a ban is introduced, considering complementary measures — such as reviewing codes of practice and coordinating relevant research — to maximise the potential for improvements in hen welfare stemming from the ban (chapter 4); and
- seeking to have Section 24A (1) of the *Food Amendment Act 1997* added to the permanent exemptions listed at Schedule 2 of the Commonwealth's *Mutual Recognition Act 1992*.

1 Introduction

This report has been prepared for the ACT Government. It follows the Commonwealth Treasurer's approval of a request by the ACT Government for the Commission to undertake public benefit tests of legislation relating to the production and sale of battery eggs in the ACT. In keeping with the functions set out in its Act, the Commission's role is limited to that of an advisory body — decisions about future action are the prerogative of government. Ministerial correspondence and the terms of reference are provided in appendix A.

The report examines the costs and benefits of:

- a ban on the sale and production of eggs from battery caged hens in the ACT; and
- a requirement that egg cartons be labelled to indicate how the eggs were produced.

The study takes account of the impacts of the legislative amendments on animal welfare, as well as on consumers and producers. It also addresses the question of whether a ban is the most appropriate regulatory response, and what substitute and complementary measures might be appropriate to meet the objectives of the ACT legislation.

This chapter looks at the background to the study and the nature of the proposed legislation. It also outlines the consultative processes used in the study and the report structure.

1.1 Background to the debate

In Australia, three major systems are used in commercial production of eggs:

- the battery cage system (birds are housed in small wire cages, typically with several other birds);
- the barn-lay system (birds are housed in barns, which have provision for nesting boxes and perches); and
- the free-range system (birds have access to open air and sunlight, as well as shelter with nesting boxes and perches).

There is debate about how these different systems affect animal welfare, including over what constitutes an admissible indicator of animal welfare. Some evidence points to adverse outcomes for hens housed in battery cages. This mainly reflects the restriction on movement and the inability of birds to perform some normal behaviours, such as dust-bathing and nesting (see chapter 4). Both nationally and internationally, concern about the welfare of battery caged hens has led to calls by animal welfare groups for greater consumer awareness about the conditions of battery caged hens, stricter codes to alleviate perceived cruelty to layer hens and, in some cases, the abolition of the intensive battery cage system.

On the other hand, not all aspects of hen welfare are improved in alternative systems. For instance, mortality rates tend to be higher and egg production — seen by some as an indicator of animal welfare — tends to be lower in non-cage systems. Importantly, some animal welfare concerns are common to all of the three main types of egg production systems currently in use in Australia — for example, culling of males in hatcheries, beak trimming, shortened bird lives and large flock sizes.

While some changes in husbandry practices can improve both animal welfare and reduce production costs and prices to consumers, there is often a trade-off between animal welfare and costs. Diverging attitudes about the nature and appropriate size of the trade-off have influenced the policy viewpoints of different interest groups.

Around the world, many jurisdictions have entertained controls on battery hens. However, governments have been concerned that, in the absence of import restrictions, prohibition of battery cage egg production would merely shift supply to those jurisdictions which continued to permit cheaper battery cage production. In many instances, import restrictions are either not feasible (because such powers do not reside with lower levels of government) or, at the national level, conflict with trade agreements or risk retaliation by trading partners. The only effective ban exists in Switzerland (appendix C).

On 19 September 1997, the ACT Legislative Assembly passed the *Animal Welfare (Amendment) Act 1997* and the *Food (Amendment) Act 1997* — see box 1.1. The legislation is intended to:

- prohibit the sale of eggs from battery caged hens in the ACT (whether produced in the ACT or imported from other jurisdictions);
- prohibit the production of eggs from battery caged hens in the ACT; and
- introduce a labelling requirement that all eggs originating in the ACT indicate the conditions under which the hens produced the eggs (for example, by barn-lay, free-range or other production methods).

The ban on the sale of battery eggs does not apply to semi-processed egg products (eg egg powder) or to products incorporating battery eggs (eg pastry and biscuits) 'imported' from other states.

Box 1.1 **Relevant ACT legislation relating to eggs from battery caged hens**

1. Abolition of the sale and production of eggs from battery caged hens

Subsection 24A(1) of the *Food (Amendment) Act 1997* states 'A person shall not sell eggs produced by a hen kept in a manner that constitutes an offence against a law of the Territory or that would constitute such an offence if the hen were so kept in the Territory'. Section 9A of the *Animal Welfare (Amendment) Act 1997* states 'A person shall not keep hens for the purpose of egg production in a battery cage system'. A definition of 'battery cage system' is provided in the Code of Practice for the Welfare of Animals: Domestic Poultry.

Subsection 24A(2) of the above act exempts a product where eggs are an ingredient in the product sold.

To give egg producers time to adjust to these changes, the *Animal Welfare (Amendment) Act 1997* also stipulates that the prohibition on the production of eggs using a battery cage system only comes into force six years after the date on which Section 24A(1) of the *Food (Amendment) Act 1997* is added to the Permanent Exemptions listed at Schedule 2 of the Commonwealth's *Mutual Recognition Act 1992*.

2. Labelling

Subsection 24B of the *Food (Amendment) Act 1997* requires that all egg cartons displayed or sold in the ACT be labelled in such a way that users will be aware of the general conditions under which the hens produced the eggs.

The ACT Government recently deferred the implementation of the new provision for a period of up to 12 months. This followed the refusal of the Australia and New Zealand Food Standards Council to agree to an ACT proposal for the adoption of a national standard of egg packaging. The Government is currently preparing the labelling expressions in consultation with relevant stakeholders.

Source: ACT Government.

1.2 Why is a public benefit test needed?

The ACT is bound by the *Mutual Recognition (Commonwealth) Act 1992* (MRA)[1] and is a signatory to the Competition Principles Agreement (CPA).

Under the MRA, a good that may legally be sold in one state or territory may be sold in any other, despite different requirements applying in the second jurisdiction. Such differences may apply to packaging, labelling, testing or restrictions on the product itself.

On its own, the MRA means that a ban on the sale of eggs from battery caged hens in the ACT would only affect the sale of eggs *produced* in the ACT — it could not prevent the sale of eggs in the ACT produced by battery hens in other states. The possibility of 'imports' would clearly undermine the intent of the amended legislation. However, the MRA includes provision for exemptions. Exemptions have been granted in a number of instances, such as a Tasmanian law relating to the sale of crayfish and a South Australian law relating to beverage containers. The ACT will seek an exemption under the MRA for section 24A(1) of the *Food (Amendment) Act 1997* (box 1.1).

However, an exemption under the MRA has the impact of reducing competition because it would prevent producers in neighbouring states selling battery eggs in the ACT.[2] This restriction on competition invokes the Competition Principles Agreement — to which the Commonwealth and all State and Territory Governments committed to in 1995 — and the requirement for a public benefit test.

Notably, the ACT Government is *not* seeking an exemption under the MRA for the new labelling requirements (Section 24B of the *Food (Amendment) Act 1997)*. This implies that egg producers outside the ACT will be able to sell eggs in the ACT without having to label them in the prescribed way. However, in the six year period prior to the implementation of the ban, any ACT producers, most notably the major ACT egg producer — Bartter Enterprises' property 'Parkwood' — will be required to label its eggs. For example, Parkwood would be required to indicate that its eggs

1 The mutual recognition of regulations — introduced by Australian governments in March 1993 — aims to remove regulatory barriers to the free flow of goods and labour between Australian states and territories. It involves each jurisdiction recognising the regulations established by other jurisdictions, even if they are different from their own rules and regulations. While the Mutual Recognition Act is a Commonwealth Act, it is binding because each state and territory have passed Acts which either refer to or duplicate the Commonwealth Act. The relevant Act for the ACT is the Mutual Recognition (ACT) Act of 21 December 1992. See ORR (1997) for further details.

2 There is also a question of whether the proposed legislation breaches section 92 of the Constitution, which requires that trade, commerce and intercourse amongst the states be absolutely free. This issue is discussed in chapter 3.

are produced by battery caged hens. Because the labelling requirement will not apply to 'imported' eggs, labelled Parkwood eggs may be at a competitive disadvantage relative to any unlabelled imported eggs. The potential impact on competition again invokes the CPA and a requirement for an appraisal of the benefits and costs of the legislative change. Figure 1.1 shows how the recent ACT legislative amendments interact with the CPA and the MRA.

1.3 What is a public benefit test?

A guiding principle of the CPA (Governments of Australia 1995, p. 8) is that legislation enacted by Australian governments should not restrict competition, unless it can be demonstrated that:

- the benefits of the restriction to the community as a whole outweigh the costs; and
- the objectives of the legislation can only be achieved by restricting competition.

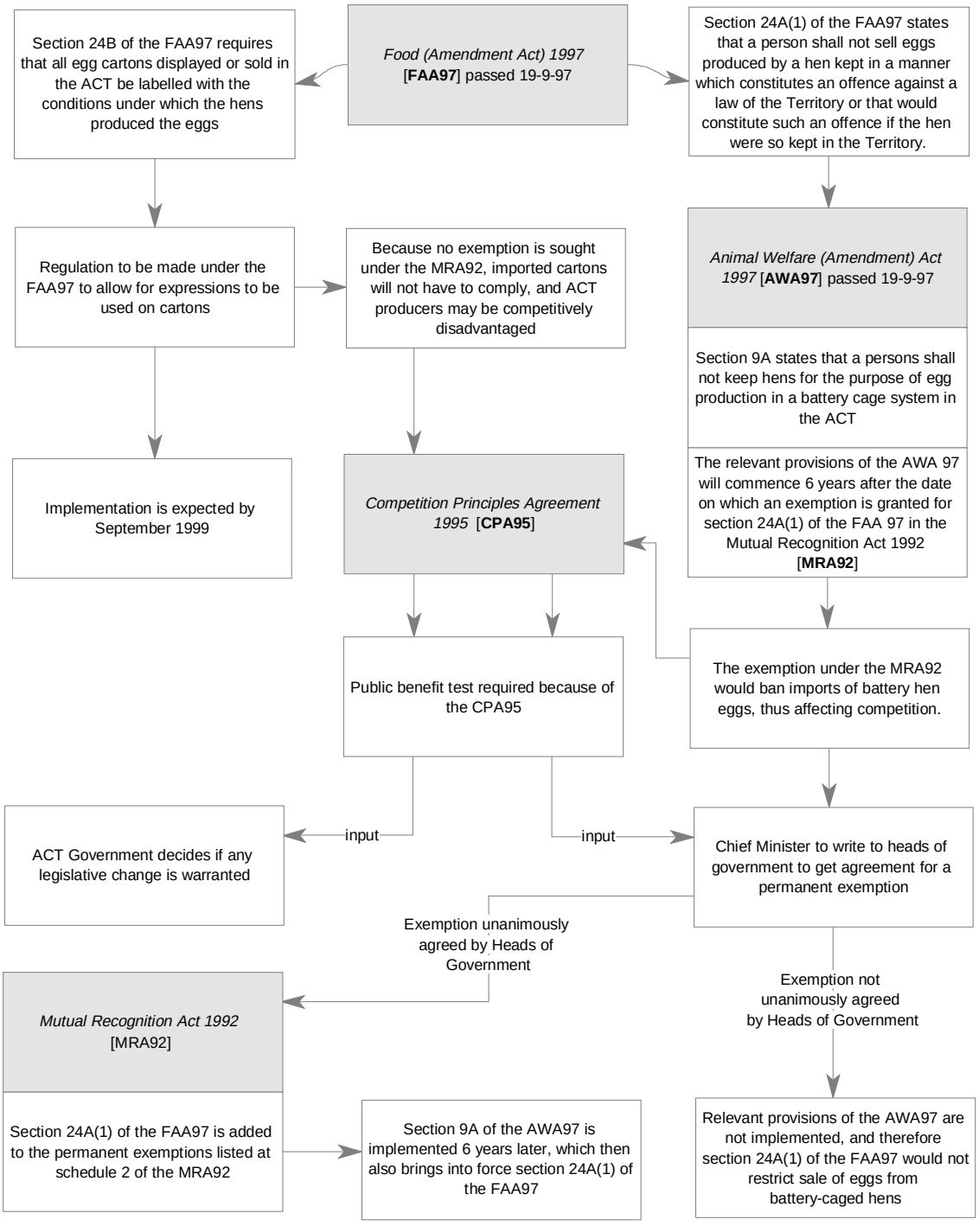
This constitutes the public benefit test. The terms of reference (appendix A) set out in greater detail some of the important features of such a test, though it does not limit the matters which may be taken into account. The terms of reference also state that the Commission "... shall not be limited to benefits and costs arising within the ACT only".

It should be noted that the test does not represent an imposition of the Commonwealth or other states on the ACT, but rather an agreed process which all Australian heads of government have endorsed, on behalf of their constituents. The outcome of the public benefit test is only one *input* into the process of law-making and review (figure 1.1). Australian heads of government decide whether to grant an exemption under the MRA, and the ACT Government decides whether any further amendment of the labelling requirement under section 24B of the *Food (Amendment) Act 1997* is required.

1.4 What is the scope of the public benefit test?

In the case of the exemption under the MRA, the test relates to the public benefit of that exemption, not to the original legislative amendment passed by the ACT Legislative Assembly. However, this amounts to the same thing.

Figure 1.1 **Interactions between relevant legislation**



Source: Based on information provided by the ACT Government.

This is because, in the absence of an exemption under the MRA, the *Animal Welfare (Amendment) Act 1997* will not be implemented. That, in turn, changes the interpretation placed by the Food (Amendment) Act on what would constitute an

offence. If the exemption is not granted, battery egg production and sale would continue to be legal in the ACT. Accordingly, the public benefit tests can effectively be seen as tests of the original legislative amendments.

1.5 Consultative processes

The study commenced in early August 1998 to run for about ten weeks. The Commission advertised the study and sought public submissions by 9 September 1998. Over 100 submissions were received (appendix B). Major submissions were distributed for comment to all organisations that made a submission.

The Commission held discussions with many of the key stakeholders including representatives of animal welfare groups, relevant ACT and Commonwealth government officials, scientists with expertise in the area and producers (appendix B). It also inspected farm enterprises operating each of the three main egg production systems.

1.6 Structure of the report

Chapter 2 sets out a framework for examining how the legislation affects the interests of animals, producers and consumers. The following chapter considers factors which could influence the effectiveness of the legislation. The likely impacts of the legislation on animal welfare, producers and consumers are assessed in chapters 4 to 6. Chapter 7 briefly explores a range of other issues relevant to the public benefit tests. Finally, chapter 8 sets out the conclusions for public policy.

2 A framework for analysis

2.1 Introduction

The broad framework for undertaking public benefit tests is set out in the Competition Principles Agreement (Subclause 1 (3)) and replicated in the terms of reference for this study. In brief, factors which, where relevant, should be taken into account include:

- government legislation and policies relating to ecologically sustainable development;
- social welfare and equity considerations;
- government legislation and policies relating to matters such as occupational health and safety, industrial relations and access and equity;
- economic and regional development, including employment and investment growth;
- the interests of consumers;
- the competitiveness of Australian businesses; and
- the efficient allocation of resources.

It is important to recognise that these factors require consideration of issues far broader then those that are commonly perceived as being addressed in 'economic' assessments. For example, they call for consideration of environmental matters and social welfare and equity issues. Indeed, as far as possible, the public benefit test should consider all relevant factors.

The need to consider all factors — not just economic benefits and costs — is reinforced by the study's terms of reference. These specifically request that account also be taken of:

- the social benefits and costs of different egg production systems; and
- the environmental benefits and costs of different egg production systems.

In the context of this study, it is essential that a broadly based test be applied, particularly to the more complex and significant of the two public benefit tests

undertaken in this study — the ACT ban on the production and sale of eggs from battery hens. This involves consideration of ethical questions concerning animal welfare, about which some in the community hold passionate views.

It seems likely that most people — including animal welfare groups — are prepared to accept that is it appropriate to rear animals for commercial use, including for human consumption. But, for many, this 'trade-off' is conditional on appropriate 'housing' and sound animal husbandry practices to ensure that the animals do not suffer unduly. However, there are quite divergent views about where the boundaries lie. For instance:

- the concerns of some vary according to the type of animal (eg between kangaroos and hens);
- there are differing perceptions about animal rights;
- views vary on how welfare can be best assessed; and
- there are large differences in the level of understanding of different people about the impacts of various husbandry practices on animal welfare.

This latter difference is not unexpected given the complexities and uncertainties involved in assessing animal welfare. For instance, Baxter (1994, p. 614) comments:

> The welfare of animals is an intrinsically difficult subject to study scientifically. The central issue in animal welfare is to determine what the animal itself is experiencing ... something that scientists cannot at present (and probably will never be able to) measure directly.

Despite such information deficiencies, it is important that existing information be drawn upon to arrive at some understanding of these inherently complex issues. Although there are obvious difficulties in assessing the analytical rigour and the relevance of the findings of the numerous (often conflicting) studies which examine factors pertinent to this study, the Commission has tried to set out the relevant benefits and costs in a systematic and objective fashion. To this end, the study seeks to distinguish between 'facts' and popular 'myths', and between factors which are common to all egg production systems and those peculiar to particular systems, in part by consulting with a representative range of stakeholders and, as far as possible, pursuing transparent processes.

The following section briefly identifies the key issues that are important for assessing whether the ACT legislative amendments are likely to yield net public benefits.

2.2 Key issues

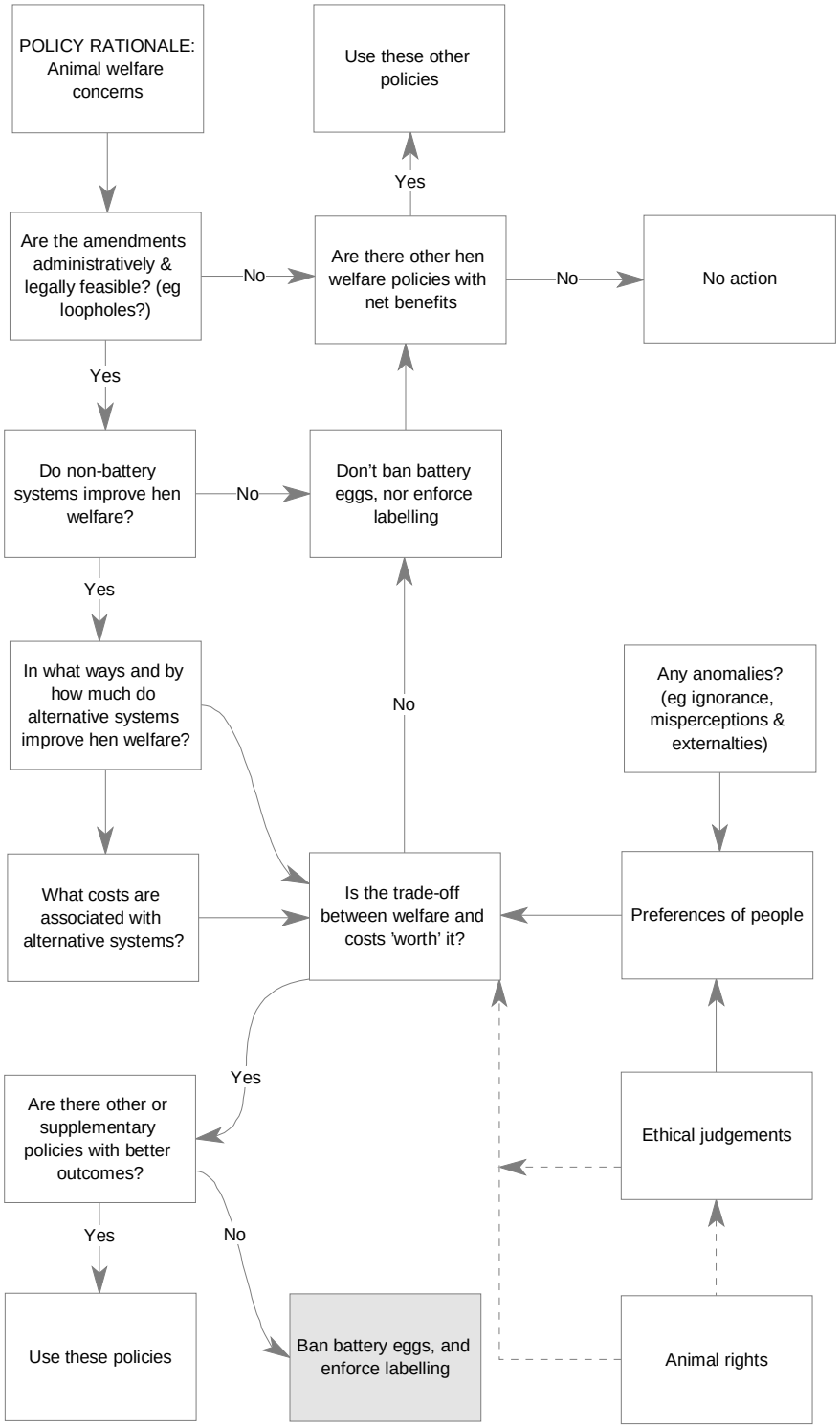
The legislative amendments applying to the production, sale and labelling of eggs passed by the ACT Legislative Assembly have been outlined in chapter 1. Underpinning the amendments are some hypotheses which clarify the main issues. These imply that:

- the legislative changes are legally and administratively feasible (ie the intent of the legislative changes — an effective ban on battery egg sales and a change in labelling — cannot be undermined by loopholes in the legislation or changes in the behaviour of producers or consumers);
- hen welfare would be improved in non-battery alternatives;
- any gains from improved hen welfare achieved by implementing the ban outweigh the costs;
- no alternative actions would achieve better outcomes; and
- consumers would more often freely choose non-battery alternatives (with resulting improvements in animal welfare) if they were better informed about the production system used to produce the various brands and types of eggs available to them. This implies that consumers cannot reliably infer this information from existing labelling.

These hypotheses — and the policy implications that follow from their analysis — are set out diagrammatically in figure 2.1. The figure necessarily simplifies the policy decision making process — for instance, by assuming the availability of sufficient information to say ‘yes’ or ‘no’ to the major questions. This framework suggests that, as a starting point, the legal and administrative effectiveness of a ban should be appraised, for example, to examine the risk of loopholes (chapter 3). If the intent of the legislation could not be achieved, this would suggest further amendments or the adoption of other policies.

Presuming the amendments are legally and administratively effective, the next step is to define and measure animal welfare and appraise how welfare is affected in different egg production systems (chapter 4). If there were no apparent increase in animal welfare from banning battery cage systems, then the regulation would have failed its most essential criterion.

Figure 2.1 **Framework for assessing the costs versus benefits**



If the ban does achieve some improvements in animal welfare, some assessment is needed of the costs and benefits of these improvements. The major cost factors are relatively easy to identify (eg higher egg prices for some domestic and commercial users, capital costs borne by Parkwood (the major ACT producer), possible job losses and additional administration costs (chapters 5, 6 and 7)). With the available information, it is possible to obtain reasonable estimates of some of these costs. On the other hand, assessing the extent and value of the benefits stemming from animal welfare improvements is extremely complex. This is because people's preferences for animal welfare may be partly masked by misperceptions and poor information (which provides the rationale for the labelling provisions). As well, animal welfare is an ethical concern, and this suggests that community standards and animal rights, rather than consumer preferences, may be an appropriate basis on which to judge what is 'right' (or in the public interest).

Even if it appears that excluding battery hen eggs from the ACT market is in the public interest, this does not address the question as to whether a legislative ban is the best policy response — alternative and supplementary policies should be examined to see if they could produce a similar, or better, outcome (chapter 8).

The following chapters look at these issues in more detail.

3 Effectiveness of the ACT legislation

It is important to consider whether the legislation passed in the ACT would be effective in achieving its stated goals, or whether actions by producers, other players in the supply chain or consumers could undermine its effectiveness. To this end, this chapter discusses the likely effects of a range of possible responses.

3.1 Section 69 challenge

Section 92 of the Australian Constitution provides for free trade between States, but does not apply to trade between a State and a Territory. However, Section 69 of the *Australian Capital Territory (Self Government) Act 1988* applies the intent of Section 92 to the ACT. It states that:

> ... trade, commerce and intercourse between the Territory and a State, and between the Territory and the Northern Territory, the Jervis Bay Territory, the Territory of Christmas Island or the Territory of Cocos (Keeling) Islands, shall be absolutely free. (Section 69 (1))

In the light of these provisions, it needs to be considered whether an interstate producer could challenge the ACT legislation on the grounds that it is contrary to the Self Government Act. If this were the case, the ACT legislative amendments would not be effective in preventing the sale of eggs from battery cage hens — it would merely result in the ACT demand for such eggs being satisfied entirely by interstate producers rather than by a mixture of interstate and local sources as happens at present.

Legal advice supplied to the Commission draws on a 1988 decision by the High Court concerning Tasmanian legislation which specified the minimum size of crayfish that could be bought or sold in the State (Cole v. Whitfield (1988)) and the underlying intent of Section 92 of the Constitution. This advice suggests that the resolution of this issue hinges on whether the ACT legislation can be characterised as 'protectionist'.

The legal advice concludes that the ACT legislation could be viewed as representing a burden on trade (because it bans 'imports' of battery eggs), but that it is not discriminatory in the sense that it does not differentiate between producers in the ACT and those located in other jurisdictions. Hence, the advice suggests that the

ACT legislation could not be characterised as 'protectionist' — the restrictions are necessary if the legislation is to achieve its intended goals.

In the absence of a case testing the legislation in the courts, it is not possible to assert that ACT legislation is immune from legal challenges. Nonetheless, on the basis of the information currently available, this seems likely.

3.2 Differential labelling provisions

As noted in chapter 1, the ACT Government's proposal for a national standard for egg packaging was not agreed to by the Australia and New Zealand Food Standards Council. In addition, the ACT Government has not sought an exemption under the Mutual Recognition Act (MRA) for the labelling amendments. Consequently, the requirement to label all egg cartons displayed or sold in the Territory with the conditions under which the hens produced the eggs would not apply to eggs imported from other jurisdictions.

Presuming the MRA exemption for the ban is granted, in the period between the introduction of the labelling requirement and the time the Animal Welfare Act comes into force (six years after the granting of the exemption), interstate producers would be able to sell battery eggs in the ACT that are not identified as such.

In practice, some interstate suppliers may elect to comply with the 'spirit' of the law and label their battery eggs accordingly. In that event, any effects that labelling has in reducing the share of the ACT egg market supplied by battery hens would be spread evenly over all suppliers of battery eggs. On the other hand, the absence of a legal obligation to label their eggs may provide interstate producers with a commercial advantage over Parkwood (who would be obliged to comply with the labelling requirements). As a result, some interstate suppliers of battery eggs may not label their eggs. This could have two effects:

- sales of battery hen eggs would be higher than would be the case if all eggs were labelled; and
- interstate producers of unlabelled battery eggs may gain market share at the expense of Parkwood.

In the latter circumstances, the effectiveness of the ACT legislation would be reduced by the sale of unlabelled imported battery hen eggs. However, this would not be a longer term problem because, once the six year transition period ends (and again presuming an MRA exemption is gained), the sale of *all* battery hen eggs in the ACT will be prohibited. Consequently, the only unlabelled eggs that could be

legally sold in the ACT would be non-battery eggs sourced from interstate producers. In this situation, it is likely that interstate suppliers of such eggs would label them (as they currently do) because they may otherwise be at a disadvantage relative to sellers of labelled eggs. However, irrespective of whether interstate producers label or do not label their eggs, the ACT labelling amendments would not materially detract from the Government's objective to ban the sale of battery eggs in the Territory once the six-year transitional period has expired.

3.3 Purchase of eggs from interstate

If the ban comes into place, some domestic and commercial consumers might choose to buy eggs in New South Wales. To the extent that this occurred, the ACT ban would merely alter the locations from which eggs are purchased, and have no impact on total sales of battery eggs or the number of hens housed in battery cage systems.

As discussed in chapter 6, the majority of egg consumption in the ACT — around 80 per cent — is consumed directly by households. The remainder is consumed indirectly — via purchases of goods that incorporate eggs (eg restaurant meals and bakery products).

For domestic egg users, changes in shopping patterns would be most likely for those residents of Queanbeyan and other border towns that usually shop in the ACT. For these consumers, the inconvenience of buying eggs in (say) Queanbeyan may be minor compared to the potential savings. In the case of Canberra residents, the savings are unlikely to outweigh the inconvenience of shopping interstate, except for a relatively small number of users (eg consumers of large numbers of eggs and/or those living or working close to an interstate seller).

The trade-off between convenience and savings would also be relevant for some commercial users (eg fast food outlets, clubs and restaurants). However, many of the largest ACT commercial users — such as bakeries and cake producers — already buy eggs in forms which are unaffected by the proposed ban (eg dehydrated or liquid egg).

Overall, it seems probable that some consumers will avoid the ban by purchasing battery eggs interstate. However, these sales are likely to represent only a very small proportion of total ACT sales.

3.4 Eggs imported from other countries

The ACT is a signatory to the Trans-Tasman Mutual Recognition Arrangement (TTMRA) which came into operation on 1 May 1998. This provides for the extension of the mutual recognition principle to goods of New Zealand origin. As a consequence of the TTMRA, the ACT Government contended that:

> ... New Zealand produced battery hen eggs that could be sold in New Zealand could also be sold in the ACT, even if Section 24A(1) of the *Food (Amendment) Act 1997* was added to the Permanent Exemptions Schedule to the *Mutual Recognition Act 1992*. That is, while Australian produced battery hen eggs would be banned in the ACT, New Zealand produced battery hen eggs could still be sold in the ACT. (sub. 74, p. 4)

The ACT Government did not suggest that, in practice, there would be a likelihood of New Zealand egg imports. This may reflect the fact that, at present, quarantine restrictions prohibit the importation of fresh eggs into Australia

Even if it were possible to import fresh eggs from New Zealand, it is not clear that this would be a commercially attractive proposition. Transport could pose some difficulties. First of all there is the cost. Eggs are a relatively bulky, low value product. Thus, transport costs — in New Zealand, for the cross-Tasman leg and in Australia — would be significant. The reliability of transport services would also be a factor. As eggs have a limited shelf life, the capacity to use locally held inventories to ensure ongoing supplies in the face of hold-ups in the transport chain would be less than that for many other products.

3.5 Substitution effects

Some large commercial users who presently use fresh battery hen eggs may be able to switch to egg products made from battery eggs which are exempt from the ACT ban (eg dehydrated egg). There is little information available to assess the likelihood and extent of this. However, as noted above, many large commercial users already use egg derivatives. For some other commercial users (such as fast food outlets), substitution may not be viable. The possibility of substitution for households is also low. Accordingly, substitution between battery hen eggs and egg products unaffected by the ban (eg egg powder) would be minor.

3.6 Enforcement

An egg produced by a battery hen is no different in appearance to an egg produced by a hen housed in any other egg production system. This raises an important

enforcement issue — it is conceivable that, in the event of a ban, some eggs produced in battery cage systems could be misrepresented as non-battery eggs.

There are, of course, risks involved for those who are prepared to engage in such illegal activities. For the large retail chains — that collectively account for the majority of domestic egg sales in the ACT — the risks are almost certainly too high. If they were implicated in any illegal actions, the damage to their reputation (and sales) would considerably outweigh the potentially higher returns on egg sales. Similar considerations apply to large egg producers.

Small producers and small retailers may face lower risks. Nonetheless, financial penalties and/or the loss of business would undoubtedly loom large in the minds of most small players.

The probability of illegal activity being detected will, in part, depend upon the enforcement strategies pursued by the ACT Government. Given the significant financial advantage that could be gained if battery hen eggs were sold in the ACT as non-battery eggs, illegal suppliers would also risk being reported to the authorities by competitors in the market who would feel 'cheated' by such illegal activities.

In summary, some eggs from battery hens may be misrepresented and sold in the ACT market as non-battery eggs if the proposed ban comes into play. However, in the Commission's view, illegal activities will largely be confined to the market fringes, and are unlikely to represent a very significant proportion of total ACT egg sales.

3.7 Summary

In common with most regulations, some of the parties affected by the ACT legislative amendments will have incentives to organise their affairs so that they can avoid the ban altogether or, alternatively, minimise any adverse effects on them.

Some legal responses — such as purchasing eggs interstate and switching to the use of battery eggs in a form unaffected by the ban (eg dehydrated egg) — and illegal responses (misrepresenting battery eggs) could undermine the intent of the ACT legislative amendments. However, the Commission considers such activities are not likely to pose a significant threat to the underlying objectives of the ACT legislative amendments.

4 Animal welfare issues

The underlying objective of the ACT legislative changes is to improve the welfare of hens. This suggests a number of issues:

- what is meant by 'animal welfare'?
- what are appropriate measures of animal welfare?
- what are the characteristics of hens and how do they affect assessments of welfare?
- what is the nature of existing egg production systems and what will replace battery egg production if the ban is implemented? Do they increase or decrease hen welfare?
- what is the nature and adequacy of existing approaches to animal welfare, such as codes of conduct?
- are economic incentives for producers likely to lead to good animal welfare outcomes? and
- what is the relevance of 'cruelty' to the proposed ban?

Each of these issues is explored in turn. [1]

4.1 What is meant by animal welfare?

The concept of animal welfare

Animal welfare is an elusive concept. This reflects the concept's numerous dimensions, the fact that welfare has a mental as well as a physical aspect, the importance of people's subjective evaluations and its historical roots. For example, the French philosopher, René Descartes, with a perspective quite foreign to current community standards, saw animals as 'mechanical robots' without feelings or pain

[1] There is a massive amount of research into layer hens and their welfare. People who are interested in quickly discovering more about the complex issues may want to examine the following references: Temple (1994), Appleby et al (1992) and Dawkins (1980). They provide an unbiased and scientific account of the relevant welfare issues.

sensation. He marvelled that these automatons "could give such a realistic illusion of agony."[2] In the late 18th century, Jeremy Bentham argued that animal welfare was a legitimate concern because animals could suffer — starting the modern scientific (and ethical) consideration of animal welfare. In the 1960s, as intensive farming grew to ascendancy, there was increasing public concern about the impacts of farming practices on animal welfare. The Brambell Report (1965) into animal welfare in the UK was the precursor to many other examinations of the impacts of intensive livestock husbandry systems on animals — and established a framework for looking at such animal welfare issues. Bowling (1989) described some of the historical aspects of the development of animal welfare as a popular public concern in Australia.

To make assessments of animal welfare, some tools for thinking about and measuring animal welfare are needed. It is particularly important to separate scientific assessments of welfare from attitudes and moral judgements about what is appropriate. Two leading UK researchers note:

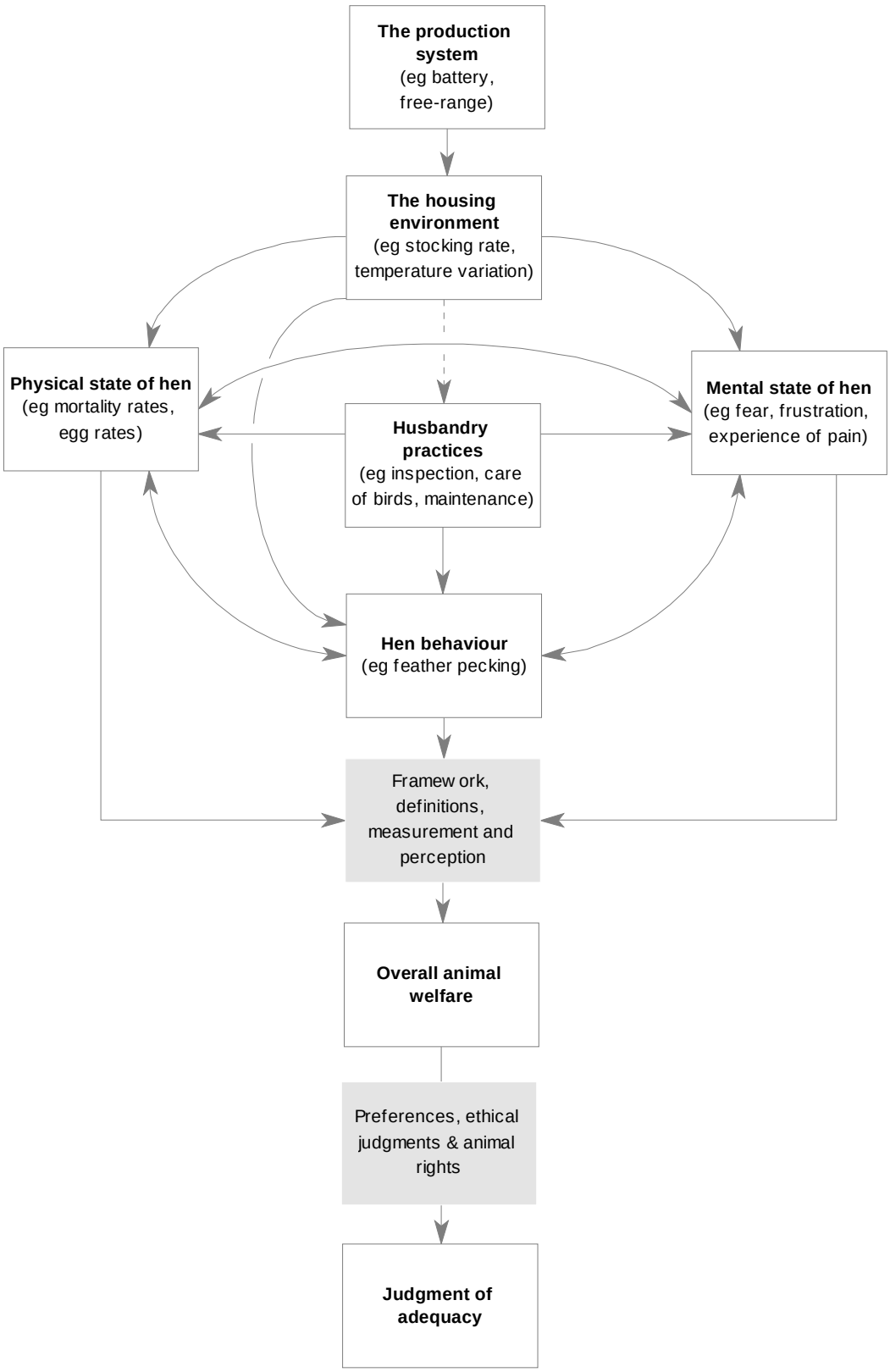
> We should use the word "welfare" in a scientific way so that it is useful when considering animal management or when phrasing legislation. Welfare is a characteristic of an animal, not something given to it, and can be measured using an array of indicators. (Broom 1991, p. 4174)
>
> ... if people feel that it is important to try to change the laws about the treatment of animals, they must have more to go on than just their intuition. 'Suffering' must be recognisable in some objective way. Otherwise the laws which emerge are almost bound to be arbitrary and might even fail to improve the lot of animals much, if at all. (Dawkins 1980, p. 2)

A framework for analysis

The framework for gauging and valuing animal welfare is outlined in figure 4.1. Since the objective of this chapter is to compare the impacts of different egg production systems on the welfare of layer hens, the logical starting point for such an analysis is to objectively describe and measure the physical environment of each system. Coupled with other factors, including the birds' genetic make-up and age, the physical environment elicits physical, behavioural and mental responses from hens. These responses tend to interact with each other.

2 *Encyclopaedia Britannica* under 'Cruelty' (1998 edition).

Figure 4.1 **Framework for evaluating animal welfare**



The current scientific approach to measuring animal welfare is to use a variety of measures (Dawkins 1980, pp. 2–3; Hemsworth and Barnett 1993, p. 101 and Broom 1991, p. 4168) to build up an overall picture of welfare. There is now broad agreement on the dimensions of hen welfare, such as mortality, adequate nutrition, rates of feather pecking, fear responses and the ability to undertake behaviours that hens value. There is also strong (but not complete[3]) agreement about what constitutes a better welfare outcome for *each* of the dimensions. Moreover, there is also a growing, though still deficient[4], body of literature which measures particular aspects of welfare in different systems. The greatest difficulty is assembling the various indicators into a summary measure of hen welfare:

> Although the welfare difference between some systems may be unequivocal it will be less clear in other comparisons because there are advantages to a system in some aspects and disadvantages in others. A problem then is the weighing of advantages and disadvantages. (Scientific Veterinary Committee 1996, p. 99)

Even if people agree on the objective state of hen welfare in any one system, their judgement about whether that state is acceptable or not will vary, depending on ethical values and preferences.

Finally, the Commission notes that animal husbandry practices — briefly reviewed in the next sub-section — are relatively weakly influenced (hence the dotted line in figure 4.1) by the type of housing system, but play a critical role in determining the welfare of hens.

The importance of husbandry

During discussions with both producers and animal welfare experts, the Commission was told of the crucial importance of appropriate animal husbandry to animal welfare. As the Standing Committee on Agriculture and Resource Management (1995, p. 1) indicates:

> The importance of good stockmanship in animal welfare cannot be over-emphasised. Persons responsible for the care of poultry should be well trained, experienced and dedicated.

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3 For example, it has been claimed that increases in floor space in cages may allow greater exercise, but may also increase aggressive pecking in White Leghorns (Working Group of the National Layer Hen Housing Review 1994, p. 147).

4 The Working Group of the National Layer Hen Housing Review (1994, p. 64 and p. 131) argued that there was a range of, sometimes severe, shortcomings of poultry science in guiding policy for preferred housing systems.

This includes practices which minimise fear in birds, appropriate maintenance of the sheds and feeding and watering systems, diligent inspection of birds, appropriate removal of spent hens, attention to cleanliness and a range of other factors. For example:

- *Fear* — Barnett, Hemsworth and Newman (1992) found that hens' fear of people explained a high proportion of the variation in the egg productivity of hens. Hemsworth et al (1993) found that small differences in the behaviour of people entering housing systems had a significant impact on the fear levels of hens. Barnett et al (1993 and 1994) found that birds were much less fearful of people in all sorts of contexts if they were familiar with people. Birds with a lack of familiarity with people had lower productivity and higher stress hormone levels when they experienced human contact.
- *Fractures* — Gregory et al (1992) found that removing birds from cages by both legs reduced femur breakages from 7.4 per cent to just below 1 per cent.

Appropriate animal husbandry practices are essential to good animal welfare outcomes in all systems of production. Different systems require different practices and the development of different bodies of knowledge — underlining the importance of research if systems of production are changed significantly. Moreover, different systems may affect some aspects of husbandry, although the links from production systems to management are weak. However:

- elevated dust and ammonia levels and the risk of falling faeces in some multi-level non-battery alternatives may discourage staff from entering the sheds to undertake sufficiently frequent and careful inspection and maintenance;
- staff to bird ratios are higher in non-battery systems (due to lower stocking densities) — which may increase hens' familiarity with humans (thus reducing fear);
- multi-tier cages in a modern cage system can have very high and very low cages which are difficult to inspect without bending or straining by staff, affecting the extent of diligent inspection (Farm Animal Welfare Council 1997, p. 20). As well, immobile sick and dead birds may be more easily detected in barn and free-range systems than in battery cage systems. On the other hand, individual inspection of mobile birds is difficult in non-battery systems; and
- there are a wider repertoire of tasks for staff caring for hens in alternative systems. Floor eggs need to be collected, pecked birds need treatment and outbreaks of cannibalism managed or avoided.

Overall, the less automated and controlled nature of non-battery systems requires greater husbandry skills (and more labour) than the battery cage system. These

greater requirements are included as an additional cost of production in chapter 5. It would be important to ensure appropriate husbandry after any changes in legislation or codes of practice. Assuming that these take place, husbandry can be ignored when comparing the different housing systems.

The role of physical versus other indicators

Most scientists and animal welfare groups argue that physical indicators, such as mortality, sickness, stress hormone levels, immuno-suppression and egg production rates per bird, are, all other things being equal, important barometers of bird welfare. While there is agreement on many of these measures of welfare, there is divergent interpretation of some. For example, a hen may show heightened stress hormone levels in some production systems, but it is unclear whether this is 'good' or 'bad' stress (Temple 1994, p. 14). Similarly, egg production per bird, combined with mortality, defines the 'biological fitness' of a hen, but it may not correspond to a higher rate of mental or physical well-being.

It is now generally recognised that physically manifested welfare indications are only part of the story, and that it is important to use scientific experiments to try to infer the 'mental' and 'motivational' states of hens.[5] A major challenge for scientists has been to impute the elusive underlying mental state of animals (and their preferences) from their behaviour.

Some of the major questions about this aspect of the welfare of hens relevant to the comparison of battery cage versus alternative systems are:

- how important is it that birds be able to perform natural behaviours, such as dust-bathing, pecking, perching and nesting?
- what are the behavioural indications of stress, fear, boredom and frustration in layer hens, and how do these signs vary by type of production system?
- how important do birds find access to natural light, and to freedom to walk around outside?
- what are the trade-offs between physical and mental welfare of hens?

A problem in inferring the mental state of hens from their behaviour is one of interpretation. Different people may interpret the same behavioural evidence differently. For example, layer hens in cages sometimes engage in 'vacuum bathing'

[5] For example, this has been acknowledged by Dawkins 1980, Broom 1991, the [EC] Scientific Veterinary Committee 1996, the [Australian] Working Group of the National Layer Hen Housing Review 1994 and the [UK] Farm Animal Welfare Council 1997.

on the floors of their wire cage. This practice may reflect a desire to engage in dust bathing, a common behaviour in non-caged environments. However, whether this practice indicates a degree of psychological deprivation for hens is open to individual interpretation. Some see such behaviour as aberrant, indicating a source of frustration and stress for the hen, thus representing a diminution in welfare. On the other hand, 'vacuum bathing' may, at the mental level of the hen, be a substitute for genuine dust bathing. One of the virtues of the revealed preference tests (described in section 4.6) is that they measure the extent to which hens themselves value certain attributes of their environment (such as a genuine dust bath) and, thus, reduce the importance of human perceptions.

A range of indicators that can be used to help assess both the physical and mental welfare of hens is set out in table 4.1. However, in applying these welfare indicators, it is also necessary to take account of the nature of the species whose welfare is being assessed. Accordingly, the nature of layer hens and the life cycle of hens within any of the intensive farm systems is described next.

Table 4.1 **Aspects of animal welfare**

Physical indicators	Housing quality factors	Behavioural indicators	Husbandry
Mortality rate	Litter quality	Dust-bathing	Ability to practice good husbandry
Sickness	Lighting	Perching	Variability in outcomes
Cannibalism	Temperature control	Nesting	
Predation	Air quality (dust, ammonia)	Wing stretching	
Injury without death	Food quality and access	Pecking in litter	
Infectious diseases	Water quality and access	Ability to exercise	
Non-infectious metabolic disorders	Medicines & supplements	Social interaction	
Skeletal problems (eg fractures)	Faeces control	Sun-bathing	
Foot problems	Ability to inspect	Expressions of fear	
De-feathering	Environmental control (shelter from rain, sun and extreme temperatures)	Mimicked behaviours	
Immuno-suppression			
Stress hormone presence			
Egg production rate per bird			
Bird weight			
Beak-trimming (de-beaking)			

4.2 The hen

Hens were domesticated about 8 000 years ago from Red Jungle Fowl (Temple 1994, p. 5). They are social animals that congregate in flocks and establish a clear

social order. They can recognise about 80 to 100 other birds in a flock, though natural flock sizes are usually smaller (ANZFAS 1994, p. 13). They have about 20 distinguishable calls, each given in a separate and definable context. While they evolved from reptiles, they have brain masses six to eleven times larger than those found in reptiles of a similar body size. They have good colour vision and sensitive touch (particularly through the beak) and hearing.

Wings are mainly used to control temperature, with birds flying short distances only. Feathers moult on a yearly basis. The feathers protect a delicate skin which is easily subject to damage if feathers are lost (Temple 1994, p. 5).

Despite significant breeding for egg number and size, modern hens still display most behaviour seen in their wild counterparts. Appleby et al (1992) indicate that hens were selected for fighting ability for some time, so that modern breeds tend to be aggressive. This intensifies problems of feather pecking and cannibalism for all intensive systems of egg production, but particularly ones where large numbers of birds intermingle.

Eggs are produced on a 24 hour cycle, with a healthy chicken producing up to 300 eggs per year (compared to 10 to 20 eggs per year in the jungle fowl; Appleby et al 1992). Healthy birds live for around six years.

4.3 What is the life cycle of hens in intensive farming systems?

Chicks begin their lives in a rearing or breeding unit. They are hatched and housed either in a deep litter or a rearing cage. One day old chicks are sorted into males and females, with the males being killed.[6] Most chicks have their beaks partly removed at one day old (and also often again at 20 weeks) regardless of the production system for which they are destined. This operation is undertaken to reduce the risks of feather pecking and cannibalism. It involves removal of between a third and a half of both the lower and upper beaks. While necessary for good husbandry reasons, beak trimming also causes pain in the hen, which may be chronic for some animals due to neuromas (Temple 1994, pp. 25–27).

Point-of-lay hens (aged around 16 to 20 weeks) are typically housed in the relevant production system for about one year. Cohorts of chickens are kept separate to

6 They are killed by either carbon dioxide gassing or maceration (a macerator chops the male chicks into small pieces at very high speed). World Animal Net, a worldwide animal welfare group, noted that, while maceration "sounds horrific, it is generally considered more humane than gassing" (http://www.worldanimal.net/hen-index.html).

avoid disease transmission between cohorts. This 'all-in all-out' policy means that a shed, or even an entire site, is completely cleared of birds, and then cleaned and disinfected before the arrival of the next cohort.

At 72 weeks of age, egg production numbers decline and average egg weights increase. But most critically, egg quality falls (for example, there are more broken eggs due to thinner shells and more watery albumen) which presents problems for the producer and consumer. Egg quality and number can be improved after moulting (ie seasonal feather loss and replacement), so that in some cases birds are kept in production after 72 weeks.

In most cases, however, 'spent' hens are removed for slaughter at 72 weeks, regardless of the system of production. Hens may suffer a number of injuries, particularly fractures, during their removal and transport (Temple 1994, p. 33; sub. 76, p. 13). Spent hens are processed into pet food, baby foods, soups and stocks. As a humane measure, hens are typically electrically stunned prior to throat cutting, although Barnett and Newman (1997, p. 394) note that "there is little doubt that, in Australia, many birds are ineffectively stunned."

It is important to note that these aspects of layer hens' lives are common across both battery and commercial non-battery systems. Some people feel unhappy with some common features of the life of hens in these systems (such as beak trimming, killing of male chicks or the slaughter of spent hens). These *may* be important issues in the welfare of hens, but the fact that they are not special features of the battery caged hen suggests that they cannot be a basis for preferring non-battery systems over battery cages.

4.4 Egg production systems: the battery cage and its alternatives

The battery cage system

Most eggs in Australia and the world are produced in battery cage systems (illustrated in box 4.1). The battery system was introduced in the US in the 1930s. By separating the birds from faeces, litter and each other, battery cages reduced disease risks and cannibalism apparent in the deep litter systems that predominated at that time (Appleby et al 1992, p. 62). They also allowed easier collection of eggs, obviated egg cleaning and, over time, permitted automation of most processes involved in egg farming (such as provision of water and food and collection of eggs).

Hens are permanently enclosed in cages in buildings, so that they receive some protection from the weather and predators. Food and water are supplied on a continuous basis.

Box 4.1 **The battery cage system**

Source: Photo taken by the Commission with permission from a producer.

Older battery cage systems consist of single level cages, relatively primitive temperature control and manual egg collection. Newer types involve tiers of cages, climate control and automatic egg collection.

Farms usually house large numbers of birds — and flock sizes have typically increased over time. In the larger production units, there can be around a quarter of a million hens, with around 30 000 hens per shed.

Cages are constructed of welded wire, including the floor, and typically house between 3 and 5 birds, depending on cage size. The floor slopes downward towards the front so that any egg rolls out of the cage. Access to water and food is through an open section at the front of the cage. In the ACT, each hen must have at least 450 square centimetres of space (which is just under three-quarters of the size of an A4

piece of paper).[7] This mandatory rate applies to birds under 2.4 kilograms (which are the majority of birds). Birds with a weight exceeding 2.4 kilograms have a mandatory minimum of 600 square centimetres (slightly bigger than an A4 piece of paper). However, minimum standards may be exceeded. The effective space available to each bird is also bigger than the allowance per bird suggests because a hen can put its head outside the cage to feed and can move around the cage it shares with other birds. While birds can move around to some extent, they are not able to open their wings fully or exercise in the way they could in more open environments.

Other systems

Barn-lay, perchery and aviary systems

These systems consist of controlled environments (closed sheds) with perches, feed and water on several levels. There may also be provision for nest boxes and space for stretching or running at ground level. Typically, a part of the floor is covered by a layer of litter (such as straw) which provides scope for scratching and dust bathing.

Flock sizes in RSPCA-endorsed Australian barn systems are between 500 and 5000 birds per enclosure at densities of no more than 5 birds per square metre of floor space (or 2000 cm^2 per bird) — though that this excludes an allowance for the space afforded by perches (RSPCA 1998). Australian barn systems (illustrated in box 4.2) appear to make less use of the vertical space in the barn than apparent in European equivalents — where tiers of perches or slatted areas may be provided. Partly reflecting their greater use of such space, flocking densities (measured in relation to the *floor* area) in European barn systems appear to be significantly higher than this, at around 650 cm^2 per bird (Temple 1994, p. 11).

Aviaries are similar to percheries, but there are raised slatted areas, as well as perches. Temple (1994, p. 12) notes that, occasionally, use of the word ‘aviary’ is applied when there is no litter floor, or where flock sizes are smaller than percheries.

Free-range systems

These involve running hens in an open paddock with a central shed or small number of sheds spread over the paddock for shelter. Typically, the sheds are similar to

7 In the US, hens have a smaller space allowance than this.

those used to house hens in the barn system (and provide for nesting boxes, perches and food and water supply), though, in Australia, the stocking rates in the sheds tend to be higher than in the barn-lay system.

Box 4.2 **An Australian barn-lay system**

Source: Photo taken by the Commission with permission from a producer.

Get-away cages and other modified cages

These are enlarged versions of a conventional battery cage. But, whereas battery cages typically have four or five birds and no perches, get-away cages house 15–30 birds with one or more internal perches. These perches allow the birds to get away from each other, hence the name. Get-away cages also have attached boxes for nesting, dust bathing and ground scratching. These cages are not in commercial use in Australia.

Conventional cages can also be modified to include scope for scratching, perching, nesting, and to have different flooring or walls. So far, these are not in commercial use in Australia, though they have some advantages in respect of behavioural freedoms.

What is likely to replace battery caged systems under a ban?

Evidence on the relative production costs of barn-lay, battery cage and free-range systems (see chapter 5) suggests that barn-lay is the next cheapest alternative to battery production. At the moment, most barn-lay production is endorsed by the RSPCA and must observe stringent standards relating to stocking rates, inspection and other animal welfare issues. However, it should not be assumed that the replacement system for battery cages would necessarily be as animal friendly as the RSPCA standard. European aviaries and percheries, for example, tend to have much higher stocking rates. Accordingly, while the Commission does make use of some of the existing RSPCA measures of welfare achieved under its barn-lay system, it also relies on other evidence about animal welfare outcomes in barn-lay or roughly equivalent systems in use elsewhere in the world.

4.5 Current approaches to hen welfare

The current industry code of conduct

Australian producers have endorsed the Australian Model Code of Practice (Standing Committee on Agriculture and Resource Management 1995, p.1) for the welfare of poultry. The code is a guide rather than a mandatory set of requirements. The code specifies that the basic needs of poultry are:

- readily accessible food and water to maintain health and vigour;
- freedom to move, stand, turn around, stretch, sit and lie down;
- visual contact with other members of the species;
- accommodation which provides protection from the weather and which neither harms nor causes distress; and
- prevention of disease, injury and vice, and their rapid treatment should they occur.

While the code emphasises physical aspects of welfare, it implies that some degree of visual contact and mobility are critical behavioural needs for hens. All major egg production systems used in Australia, including the battery cage system, comply with this code.

Other animal codes tend to place more emphasis on behavioural needs and to specify them differently.

Other standards including the five freedoms

In its review of the welfare aspects of layer hen housing, the Working Group of the National Layer Hen Housing Review (1994) adopted the approach it called the 'five welfare freedoms' (box 4.3).

Box 4.3 **The Senate Select Committee's animal welfare 'freedoms'**

The five freedoms consist of freedom from:

- hunger and thirst;
- physical discomfort and pain;
- injury and disease;
- fear and stress; and
- freedom to conform to all essential behaviour patterns.

Source: The Working Group of the National Layer Hen Housing Review (1994).

This approach seems broadly compatible with that of the Australian and New Zealand Federation of Animal Societies (ANZFS) (box 4.4), except that ANZFS more clearly specifies the nature of the behavioural needs of hens.

Box 4.4 **ANZFAS approach to evaluating animal welfare**

ANZFAS has used the following framework to question current intensive animal production practices and to examine the work of researchers who have provided objective answers:

Physical health:

Does the animal have adequate food and water?

Is it free from pathogens, injuries or painful deformities?

Behavioural needs:

Which behaviours found in unrestricted populations can animals not perform? What physical signs of stress do confined animals show?

What behavioural signs of frustration do animals show?

What conditions do animals themselves prefer?

Source: Oogjes (1996).

Taken literally, no farm system can actually (or reasonably be expected to) provide complete freedom from any of the problems listed in the above codes. For instance, some hens will inevitably die or become exposed to pathogens. The issue is whether any given system provides animals with an environment in which these risks are acceptably small.

There is broad agreement by scientists, animal welfare groups and producers about how to measure welfare outcomes of the first three indicators in box 4.1. There is less agreement about what is entailed by essential behaviours or needs[8], even if it is recognised that at least some are important. This is because the word 'essential' means different things to different people, as does the degree to which they suppose that the absence of an essential behaviour translates to a reduced level of animal welfare.

The role of economic incentives in animal welfare

Some hold the notion that the economic self-interest of poultry farmers tends to lead to good welfare outcomes. If true, it would tend to minimise requirements for codes of conduct, other regulations and oversight of poultry farms.

Good economic practice does provide a floor to animal welfare during the production phase. This is because at some point a cheaper housing environment increases mortality rates and decreases egg productivity to a point which may not justify its lower capital or labour costs. However, depending on the relative costs of labour, cages, buildings and the hen stock, it may be cheaper per egg to run a system with more intensively stocked cages than currently occurs, even if this decreased animal welfare along some agreed dimension (such as through elevated mortality rates). As well, farmers do not have strong economic incentives to care for individual sick birds or to dispose of 'spent' hens humanely.

Accordingly, while farmers typically have considerable concern for the welfare of their animals (Dawkins 1980, p. 32), it cannot be presumed that *economic* incentives guarantee good welfare outcomes. The cheapest system may not provide 'acceptable' levels of hen welfare.

8 'Needs' are a difficult concept, whose scope and interpretation is difficult. For example, Jensen and Toates (1993) argue that needs are hierarchical, rather than present or not present. However, some scientists, such as Dawkins (1983), are able to test facets of the concept by assessing animal 'motivation' through choice experiments.

The other avenue through which economic incentives may have a bearing on animal welfare outcomes is through consumer preferences — an issue explored in chapter 6.

4.6 Impacts on welfare of the different systems

All of the systems of intensive egg production have both advantages and disadvantages for the welfare of the hens (as summarised using review articles and abstract indexes in tables 4.2 and 4.4). This section starts by considering differences in mortality rates in the different systems, and then summarises a wider range of measures.

Mortality rates

One of the most clearly measurable indicators of hen welfare is the annual mortality rate (table 4.2). Rates are typically higher in alternative housing systems than battery cages.

However, mortality rates have to be carefully interpreted. There are two welfare implications associated with mortality rates:

- even if death involves no suffering, low mortality rates imply a later death, which is generally preferred to an earlier one; and
- death may be associated with suffering. There are two modes of death with associated time periods for hens. First, from 20 to 72 weeks a hen may die from a variety of causes, from sickness to cannibalism. These deaths will involve suffering, at least for some hens. Second, the surviving 'spent' hens are removed from cages, transported to an abattoir and slaughtered. If this involved negligible suffering, the second time period could be largely ignored when looking at hen welfare. However, as cited in this chapter, the process of slaughter is also likely to contribute to the suffering of hens (for example, through fractures and fear) — which suggests that it should be incorporated into any measure of hen welfare.

A measure which encompasses both welfare implications of mortality is the expected life of hens. If hens lived out their natural lives, then large disparities in annual mortality rates tend to generate significant disparities in expected lives (as shown in column 3 in table 4.3). However, the fact that hens in both systems are slaughtered around week 72 brings the expected lives close together. For example, the expected life of a hen in a system with 5 per cent mortality in weeks 20 to 72 is only 1.2 weeks greater than a hen in a system with 10 per cent mortality over the same period. As well, the average expected life of hens is greater in a farm where

annual mortality rates are higher, but the farmer decides to run a flock for a second production year (column 4 in table 4.3), compared to a farm with one year of production and low mortality rates. Thus, disparities in mortality rates up to week 72 may tend to exaggerate the real differences in the welfare of hens in different systems.

Table 4.2 **Mortality rates in hens in different housing systems**[a]

Period	*Cage*	*Barn, Perchery, aviary*	*Free - range*	*Source*	*Type of data*
20-72 weeks	5	5	8	Appleby et al 1992, p. 76	n.a.
20-72 weeks	..	Low mortality rates, comparable to battery systems[b]	..	Advice from Victorian and NSW RSPCA representatives for their accredited barn-lay farms	Commercial farms in Victoria and NSW
20-72 weeks	5.6	10.8	..	Barnett 1998 (experimental data)	Experimental
20-72 weeks	5.4	4.6	..	Keeling 1989 (cited in ANZFAS 1994)	..
20-44 weeks	2.5	1.4	..	McLean, Baxter and Michie (cited in ANZFAS 1994)	..
20-60 weeks	2.6	3.8	..	Ehlhardt, Donkers and Gerritsen 1989 (cited in ANZFAS 1994)	Experimental
21-72 weeks	5.8	8.5	..	Rauch (1989) (cited in ANZFAS 1994)	..
20-72 weeks	5.2	8	..	Amgarten and Meierhans (1992)	Commercial farms
20-72 weeks	..	2.8 to 4.6	..	SEG Advisory Service, Zurich, (cited in Swiss Society for the Protection of Animals STS 1994)	Commercial farms in Switzerland
20-72 weeks	..	2.6	..	Strasser 1992 (cited in Swiss Society for the Protection of Animals STS 1994)	Commercial farms in Switzerland
20-72 weeks		Higher than battery cages by 2.4%	..	Morgenstern and Lobsiger (1993)	Commercial farms in Switzerland
Over a flock life of 440 days	14	..	..	Carter (1989)	Commercial farms in the US
18-70 weeks	4 to 5	..	10-12	Jordan and Pattinson (1996)	Commercial farms in the US
16-76 weeks	6	..	..	Judgement of Justice Bell (1997)	UK Commercial farms
Batch length of 60 to 72 weeks	8	15 - 33	8-10 up to 25	NSW Farmers' Association (sub. 78)[c]	Australian commercial farm
20 - 72 weeks	5-10	2.9-5.7	2.6-3.9	Macindoe (1987, p. 131)	UK experimental farms
410 days	8.5	6.8	..	von Horne (1997)	Commercial farms in the Netherlands
20 to 72 weeks	5-10	12-19	..	Information provided to the Commission from a number of poultry farms	Commercial Australian farms
19-168 weeks	Mortality the same across aviary and cage systems.		..	Taylor and Hurnik (1996)	Experimental

a Mortality rates are expressed as a percentage of birds initially housed which die over the period concerned.

b A 1% mortality rate per month is the maximum acceptable, and a 1% rate must trigger diagnostic and corrective action (RSPCA 1998).

c Mortality rates for barn-lay and free-range are based on a 60 week batch length, whereas that for battery caged hens is 72 weeks.

Table 4.3 **Expected life of hens with different annual mortality rates**

Annual mortality rate 20 to 72 weeks	*Expected life with slaughter at 72 weeks*	*Expected life with no forced slaughter*	*Expected life with 2 years of production*
Proportion	Weeks	Weeks	Weeks
0.05	70.7	185.9	115.0
0.10	69.5	178.3	111.4
0.15	68.2	170.8	107.7
0.20	66.9	150.5	103.4
0.25	65.6	124.5	98.2

Source: Appendix F.

Other welfare measures

A significant scientific literature has developed on the performance of different housing systems, covering a wide variety of indicators. However, it is sometimes difficult to compare results from one paper with another due to differences between:

- the breeds of hens used;
- the exact nature of the housing system (eg aviary compared to deep litter);
- whether hens were beak trimmed or not;
- the length of the experimental period, and the number of hens observed; and
- other aspects of the experimental design.

The standard and scope of analysis also vary considerably, making it difficult to make assessments. In producing the summary in table 4.4, the Commission has emphasised objective primary research.

Disadvantages of non-battery alternatives

The more rigorous studies suggest that the main animal welfare disadvantages of non-battery systems relative to cages are:

- mortality rates in non-battery alternatives appear to be typically higher than in cages. The higher rates reflect a greater incidence of cannibalism and sickness in non-battery systems. However, some barn-lay farms reported mortality rates which were lower than the best achieved in battery cages (table 4.2). Mortality rates can be low if appropriate husbandry techniques are used — regardless of the system. Moreover, as noted above, the elevated mortality rates in non-battery systems should be put into perspective. Hens from all intensive production systems are typically slaughtered at 72 weeks.

Table 4.4 **Aspects of animal welfare in battery cage and barn-lay systems**

Indicators	*Battery*	*Barn-Lay*
Physical indicators		
Mortality rate	5 to 6 per cent per year.	Estimates vary considerably, but tend to be somewhat higher than in cage systems. Commercial barn systems in Australia average around 10 to 15 per cent per year (Advice from Greg Parkinson; also see table 4.2).
Cannibalism	Less likely than in barn-lay or free-range due to small size of groups in cages (Temple 1994, p. 31).	More likely the higher the stocking rate, and much more likely in the absence of beak trimming (Temple 1994, p. 49). Also see Morgenstern and Lobsiger (1993).
Predation	Not a problem.	Not a problem, but can be a problem in systems (eg free-range) which allow outside access.
Sickness	Infectious diseases lower than in alternatives, but non-infectious metabolic and skeletal problems are greater (Appleby et al 1992, pp. 4647).	The Swiss data reported by Morgenstern and Lobsiger (1993) point to higher sickness rates, but the Swiss system is based on small farms where prophylactic treatment can be sub-optimal. Barnett and Newman (1997) note higher coccidial and other infections.
Fracture rate in birds	Lack of regular movement decreases bone strength — but not clear that strength is reduced in cage systems (Temple 1994, p. 32). 29% of birds have fractures at the end of their life, some of them probably sustained during removal from the cages (Barnett & Newman 1997, p. 392). ANZFAS (1994, p. 23) cites evidence that around half of cage bird breaks occur prior to removal from cages.	14% per cent of free-range birds have fractures at the end of their lives — probably a good proxy for barn-lay hens (Barnett & Newman 1997). Gregory et al (1990) found 10% of perchery birds had fractures (cf 24% of caged birds). Early fractures appear to be higher in percheries (evidence cited by ANZFAS 1994, p. 24). Newman and Leeson (1998) find stronger bones in hens kept in aviaries compared to cages.
Foot problems	Claw length too great in some birds. Abrasive strips in cages eliminate claw length problems (Temple 1994, p. 28). Toe pad hyperkeratosis occurs in cage hens (Abrahamsson 1998).	Can get foot damage with wet litter or badly designed perches (Duncan, Appleby and Hughes 1992) and Temple (1994, p. 49). Bumble foot and keel bone lesions occur in systems with perches (Abrahamsson 1998) and Morgenstern and Lobsiger (1993).
Feather pecking	A major source of feather loss, not necessarily reduced by beak trimming (Temple 1994, p. 28ff). Tanaka and Hurnik (1991) found 4.1 per cent of caged birds were affected in a two week observation period cf less than 0.1 per cent in aviaries.	Less than in battery cages (Temple 1994, p. 28ff) and partly reduced by beak trimming and good foraging possibilities.

Table 4.4 **Continued**

Indicators	*Battery*	*Barn-Lay*
Stress hormone presence	Barnett (1998) records 0.46 nmo1/L of corticosterone in a cage system with two birds per cage and a space allowance of 752 cm^2 per bird (a space allocation much higher than the average in commercial cages).	Barnett (1998) records 1.54 nmo1/L of corticosterone in a barn system with 7 birds per square metre and flock sizes of 900 hens. This higher level suggests greater stress levels in barn systems — but note the data are experimental and the control cage group is not representative of commercial cages. Koelkebek and Cain (1984) have also shown lower concentrations of corticosterone in cages than in floor pens. However, Gibson et al (1986) found lower corticosterone levels in yards than cages.
Egg production rate per bird	Around 290 to 300 per year per hen at point of lay.	Around 250 eggs per year per hen at point of lay (advice from Greg Parkinson). Macindoe (1987, pp.127-128) found egg production rates to be roughly equal between battery systems and alternatives.
Bird weight	Higher than in barn-lay systems.	
Beak-trimming (de-beaking)	Customary, but probably not necessary in all breeds with good lighting control. Trimming greatly impairs birds' sensory abilities (Appleby et al 1992, p. 14; Temple 1994, pp. 25-27).	Customary and probably necessary in current systems to reduce risks of cannibalism and feather pecking. The Swedish have deferred a ban on the battery caged system because the animal welfare implications of a non-battery alternative *without* trimming were so poor.
Housing quality factors		
Dry litter	No litter (wire floor).	Litter available for pecking and bathing, but it can get wet with parasite and bacterial problems. Design of the barn system may overcome these problems.
Lighting	Strong control through artificial lighting.	Sunlight in some systems, but note that light control can be used to moderate aggression.
Temperature control	Very good in new, moderate in old.	Moderate. Environmental temperature control on par with new battery cages systems is not economically feasible in barns with low stocking rates because of lack of bird mass as a source of heat.
Dust control	Probably better than alternatives.	Temple (1994, p. 49) and Appleby et al (1992, p. 46) report higher levels (with some problems for hens and humans). However, automatic egg collection can reduce human contact with dust.

Table 4.4 **Continued**

Indicators	*Battery*	*Barn-Lay*
Ammonia control	As above.	As above, but some new methods may reduce the problem (Barnett and Newman 1997).
Food quality and access	Excellent.	Some large-group systems may need careful management to guarantee access for all animals (Temple 1994, p.24).
Water quality and access	Excellent.	As above.
Shelter from rain and sun	No problem.	No problem.
Faeces control	Excellent.	Contamination of birds by other birds' droppings can occur (Temple 1994, p. 54), but this is dependent on the design of the system. It does not occur in systems without multi-tiers — which dominate in Australia.
Behavioural indicators		
Dust-bathing	Not possible. Dawkins (1987) suggests that hens place low value on dust-bathing, but more recent experiments by Mathew et al (1993) suggest otherwise.	Scope for dust-bathing.
Perching	Not possible.	Possible.
Nesting	Not possible, but summarised as a highly desirable feature of housing by Temple (1994, p. 41). Hens appear to be frustrated if prevented from nesting, and will pay a high price to gain access to nesting boxes (Hughes et al 1989).	Nesting is possible.
Wing stretching	Temple (1994, p. 37) suggests allowance for walking and wing and leg movements require around 1000 to 1500 cm^2 per hen (well over the current allowance of 450 cm^2)	Possible.
Pecking in litter	Not possible.	Possible.
Ability to exercise	Very limited.	Possible.
Social interaction	Stable social order of small group.	Tend to be large groups and some instability. Individual recognition seems to be limited to flocks of up to about 100 birds (Hemsworth and Barnett 1993, p. 104). Larger flocks lead to pecking order violations.
Sun-bathing	Not possible.	Not possible, except if a sunny area is incorporated as part of the design, or if outside access is facilitated (as in free-range).

Table 4.4 **Continued**

Indicators	*Battery*	*Barn-Lay*
Expressions of fear with humans	Birds have less familiarity (particularly those in upper tier cages) which increases fear. Collection of hens at the end of lay probably increases fear.	More familiarity.
Comfort behaviours		Birds in aviaries perform comfort behaviours more commonly (roughly 5 times more frequently), suggesting greater levels of comfort (Tanaka and Hurnik 1992).
Stereotyped and vacuum behaviours	Vacuum dust-bathing is higher in cage systems. Tanaka and Hurnik (1992) found 7 to 24 per cent of caged birds engaged in stereotyped behaviours, compared to 1 to 2.7 per cent in an aviary system.	
Other		
Propensity for good husbandry eg how easy is inspection?	Easier inspection in old vs. new systems. Cages in high or low tiers can be harder to examine.	Large flocks tend to be harder to inspect.
Variations between establishments and across flocks	Probably more consistent quality.	Husbandry probably requires greater skill (Appleby et al 1992, p. 73).

- egg production rates appear to be lower in non-battery systems — which some see as an indicator of the biological 'fitness' of hens. On the other hand, Dawkins (1980) disputes that productivity is a good measure, by itself, of animal welfare. Similarly, Pearson (1983) notes that birds with severe foot damage had unaffected egg productivity — suggesting that egg production per bird is, by itself, only a partial measure of animal welfare. The AEIA (sub. 76, p. 13) acknowledges that "It is true that unhappy hens do lay eggs."
- barn-lay systems, the most likely replacement for battery cages, may introduce respiratory problems for hens (and possibly some humans — see chapter 7) because of higher dust and ammonia levels;
- temperature control is still fairly rudimentary in barn systems compared to the environmentally controlled battery cage sheds — though this may have bigger adverse impacts on egg productivity and feedstock conversion rates than on animal welfare; and
- it appears that to achieve a given standard of physical welfare in hens, greater husbandry skills are required for non-battery systems compared to battery

systems. This may have implications for guidelines, extension services and welfare enforcement if battery production were abolished.

Advantages of non-battery alternatives

The advantages of non-battery systems hinge on the ability of hens to exercise and perform certain behaviours, *and* the value to animal welfare from expressing such behaviours. Non-battery alternatives allow hens the full capacity to dust-bathe, perch, nest, wing stretch, peck in litter and exercise. These are normal behaviours of hens, but how important to welfare are they?

One way of trying to find out what a hen 'needs' is to observe its behaviour when it is in a restricted environment. Two general responses occur. The animal may still try to perform certain normal behaviours despite the absence of all the necessary conditions — so-called 'vacuum' behaviour. Thus, a bird may act as if it is dust-bathing in a wire floored battery cage, notwithstanding the obvious absence of dust. A second response is displacement activity, whereby a hen will perform alternative actions.

The presence of displacement and vacuum behaviours is seen by some to reveal what needs are important to hens. Other evidence is the behaviour of birds when a constraint is removed. For example, birds released from battery cages tend to show increased wing flapping and stretching (Nicol 1987). However, it is not clear that all vacuum or displacement activity reveals lower animal welfare. For example, some dogs will turn in circles on a sitting room carpet before sitting down. This is likely to be a vacuum behaviour; in their natural state animals will engage in such behaviour to level the grass for more comfortable sitting (Dawkins 1980). Most would not see this as an indication that the dog is suffering.

One way of overcoming people's subjective interpretation of animal behaviour and the risk of anthropomorphism (assuming that animal behaviour can be interpreted by analogy to human biological and cultural experiences), is to conduct experiments which reveal the preferences of animals themselves. Anthropomorphism can lead to both poorer animal welfare outcomes *and* higher costs of production (box 4.5).

Dawkins (1983, 1987, 1990) and others have shown how animals will work for changes in their environment, or will give up food or space in order to obtain other environmental features. Dawkins (1987) found that hens were not willing to work very hard for litter, but in a more elaborate experiment, Mathew et al (1993) found that hens do appear to value litter highly. Faure and Lagadic (1989) show that hens

are willing to work for greater space in cages.[9] Duncan and Kite (1987) have found that hens are willing to pay a high 'price' for nesting boxes, while Smith et al (1990) also demonstrate that hens display a high motivation to nest.

Box 4.5 **The Brambell floor**

The Brambell Committee strongly recommended that the floors of battery cages should be made of a heavy rectangular mesh instead of the fine hexagonal mesh in use at the time. The Committee thought that standing on the fine mesh was uncomfortable for the birds. The new mesh, however, increased the number of broken eggs, and would have pushed up production costs had it been adopted. More problematically, the hens themselves voted with their feet — for the old system.

Two animal experimenters, Hughes and Black, found that hens which could voluntarily choose between the two floors, spent much more time on the fine rather than the heavy mesh. Photographs showed that the hens' feet appeared to be better supported by the fine mesh, explaining their preference.

Source: Dawkins (1980).

On the other hand, some commentators say that hens are unlikely to suffer from space restrictions or the absence of nesting boxes and dust-bathing in cages because they 'never knew anything different'. However, Cooper and Appleby (1995) find no differences in the motivation to use nests between hens experienced or inexperienced with nests. This suggests that nesting-box 'needs' may be basic for hens.

Much of the literature on hen behaviour suggests that dust-bathing, nesting and perching are important behaviours for hens, and that a production system that does not allow their appropriate expression is flawed. Hens in non-modified cages cannot complete any of these behaviours to a satisfactory extent. The RSPCA and a range of other animal welfare groups all oppose battery cage systems on the basis of these behavioural restrictions.

The confinement of birds in relatively small cages has also attracted considerable criticism from some members of the general public in Australia and elsewhere for many years. In this study, the Commission received around 70 submissions from individuals expressing their concern about what they perceived as the suffering endured by hens kept in a cage environment and supporting the proposed ACT ban. Extracts from some of these submissions are set out in box 4.6.

9 Though note that Hemsworth and Barnett (1993, pp. 102–103) find no systematic evidence that confinement adversely affects corticosterone levels in hens, an indicator of 'stress', though this may be a misleading indicator of welfare (Temple 1994, p. 14).

Box 4.6 **Extracts from submissions supporting the ACT ban**

Any community would benefit if the practice of battery hens was outlawed. There is an alternative. (J. Fairleigh, Eleebana, NSW)

It is my heartfelt wish that you will ban battery hens. Hens need to be in the open to scratch, flap their wings and enjoy fresh air and sunshine. (E. Smith, East Bentleigh, Vic)

I consider the keeping of fowls in battery cages the cruelest thing I have seen. To force a bird to stand in one place with not even enough space to open its wings must be considered extremely cruel. (B. Jordan, Fern Bay, NSW)

It has become abundantly clear through media attention and through information from community groups that the conditions under which egg producing hens are kept have to be described as appalling. ... Ordinary citizens keeping animals under such conditions would be accused of cruelty to animals. (P. & G. Lynga, Duffy, ACT)

I would like to voice my disgust and sorrow for the plight of the "Battery Hen". Please stop this cruelty and these money grubbing people taking advantage of these animals. (T. Elwis, Argenton, NSW)

I implore you to please consider absolutely banning as soon as possible, the method of battery egg production in the ACT. This cruel, barbaric practice is beyond comprehension and surely it is up to Canberra/ACT to set an example to every other state. (P. McEwen, Croudace Bay, NSW)

The prime consideration to make the barbarian Battery Cage system unlawful is animal welfare; it is an extremely cruel system to produce eggs by such means. (A. Herlihy, Kalamunda, WA)

More humane alternatives to battery egg production must be implemented to better address the welfare of hens, provide consumers with higher quality eggs, and also help provide more jobs. (D. Ogilvie, Box Hill, Vic)

Battery farms should be banned in all Australian States, not just ACT. (M. Shannon, Waratah West, NSW)

I would like to see the ACT lead the way to eliminate animal cruelty by way of Battery hens. (I. Ball, Birmingham Gardens, NSW)

Source: Submissions.

Animal scientists consistently report major drawbacks for hens in existing battery cages (box 4.7) — but also see problems in alternative housing systems. For example, the UK Farm Animal Welfare Council (1997, pp. 22–23) recommended the phasing out of battery cages in the UK, but subject to the control of aggressive pecking and cannibalism in alternatives.

Similarly, the EU Scientific Veterinary Committee (1996, p. 104) noted that:

> At present there is no ideal commercial system for laying hens from a welfare point of view. Further development is necessary in all systems, but enriched cages and well designed non-cage systems have already been shown to have a number of welfare advantages over battery cages in their present form.

On the other hand, the Australian Working Group of the National Layer Hen Housing Review (1994) — which comprised industry, animal welfare, government and scientific stakeholders — argued that alternative systems for the husbandry of layer hens provided for physical welfare no better than do cage systems. Consequently, the Working Group (p. b) recommended:

> ... that no attempt be made to ban or to phase out layer cage systems for egg production in Australia until research work conducted both in Australia and overseas shows that alternative systems provide a demonstrable welfare advantage which is not offset by increases in disease prevalence, in the increased use of medication or by working conditions for stockhandlers which are poorer than those operating for caged housing.

In all of these appraisals there is a common undercurrent of support for continued scientific research to manage some of the key deficits of alternative systems.

Prospects for improvement over time

A pertinent question is the extent to which the deficiencies noted by many commentators in all housing systems can be changed over time. Significant improvements in animal welfare (for example, reductions in mortality rates) have been achieved in battery systems over the last twenty years. For example, Appleby et al (1992, p. 25) indicate that about 12 per cent of hens would have died per year in a well-run laying system in the 1970s, while this is as low as 2 to 3 per cent in the 1990s.

Battery cage systems — unless modified to include perches, nesting boxes, and litter — cannot meet some of the behavioural requirements identified as important. Cage modifications are certainly possible, but they effectively represent a whole new housing system, rather than an incremental improvement in the existing system. Nor are there good prospects for future significant reductions in the (existing low) mortality rates in battery cages.

However, in newer or less frequently used systems, such as barn-lay and free-range, it seems likely that mortality and other aspects of animal welfare could be significantly improved if research were oriented towards these systems.

Box 4.7 **What the scientists say about the battery system**

Appleby at al (1992, p. 41) suggest that there are several adverse features of the battery cage system, which tentatively, they regard as unsatisfactory for the welfare of hens.

Temple (1994, p. 35) suggests that the scientific evidence is compelling enough to make provision of suitable dust for bathing highly desirable. He also notes that the case for provision of a nest site "is already very strong, as long as one accepts the evidence for high motivation, frustration, and hence suffering". (pp. 42–43)

Broom (1992) suggests that for hen's welfare to be good they should have adequate exercise, access to nesting boxes, and the ability to peck and dust-bathe.

Baxter (1994, p. 618) argues that "three lines of evidence point to suffering on a continuous and repeated basis throughout the hens' confinement in a cage".

The Scientific Veterinary Committee of the European Commission (1996, p. 103) noted that: "current battery cage systems provide a barren environment for the birds. Birds are for instance not able to show all normal movements, to obtain adequate exercise to prevent bone weakness, or to lay eggs in a nest. A better system for housing hens is clearly needed."

The Commission spoke with a number of Australian scientists working in layer hen research — all acknowledged significant drawbacks to animal welfare from the battery cage system. On the other hand, they all also saw some drawbacks in alternative systems.

Barnett (1998) notes that:

> It must also be recognised that since the barn hen sector of the egg industry is in its early stages of development in Australia, there is an expectation that, given additional research and industry experience, both the level of production and bird health will be equivalent to that achieved in cage systems. This expectation is based on the results being achieved overseas and local experience.

Even in Europe, where commercial production in barn systems has a longer heritage, there is an expectation of future gains (EU Scientific Veterinary Committee 1996, pp. 105ff and the UK Farm Animal Welfare Council 1997, pp 15 –16).

Because of the significant prospects for future improvements, using existing data on mortality, cannibalism and other animal welfare indicators may provide a biased indicator of the ultimate welfare standard achievable. For example, new breeds (Craig and Muir 1996, Muir 1996, Barnett and Newman 1997, ANZFAS 1994, p. 17), different diets (Ambrosen and Petersen 1997) and a number of other

strategies may reduce cannibalism and reduce the need or severity of partial beak removal.

The manipulation of many variables — such as barn-lay design, litter types, stocking rates, pens sizes, hen breeds used, selective breeding out of aggressive traits, feed types and additives, lighting control, husbandry practices, chemical treatment and inoculation strategies, temperature control and ventilation — offer greater scope for improvement of hen welfare in these production systems than they do in the battery cage system.

What is not known

While there has been a huge amount of research on the welfare of hens in different contexts, some researchers point to the inadequacy of information in some important areas. For instance, Barnett and Newman (1997, p. 396), in a recent review article, indicate the urgent need for further replicated experiments of the welfare impacts of non-cage systems and for more data on productivity and mortality if producers are to be encouraged to use these alternative housing systems. They also point to a need to check whether practices and designs used effectively overseas function well in Australia.

4.7 Non-scientific aspects of animal welfare

So far, the Commission has examined scientific evidence about the nature and measures of animal welfare in different production systems. The analysis has proceeded on the basis that welfare is a characteristic of an animal which can be assessed objectively without moral judgements (Broom 1991, p. 4168). However, judgements of animal welfare in different systems are often affected by emotional and moral considerations. In some cases, this can lead to poor use of evidence about the relative impacts of different systems on animal welfare (as noted by Dawkins 1980). In other cases, moral considerations are appropriate when judgements are being made about what constitutes an unacceptable level of animal welfare, such as when treatment is deemed cruel. These issues are examined in the next two sub-sections.

What is not good evidence of poor animal welfare?

Animal welfare is an emotive issue. As such, people who are horrified by one-off examples of adverse welfare outcomes may incorrectly deduce that these outcomes

are somehow typical of the everyday outcomes for hens in a given production system. For example:

- even an expert farmer will have bad outcomes for some hens, regardless of the system. On average, a poultry farmer with a (good) 5 per cent annual mortality rate in a stock of 250 000 birds will be removing about 35 dead birds a day. Some birds will suffer de-feathering. Some will be subject to cannibalism.
- in a farm with poor husbandry practices, sick birds will be left untreated and some dead birds will rot in the cages, in the barn or on free-range pastures.

None of these outcomes are good evidence of the deficiencies of a farming method as whole, unless they are endemic and at high levels — neither of which is true for any of the commercially used systems. Thus, arguing from particular instances of poor outcomes or neglect is not relevant to the objective evaluation of the merits of different egg production systems.

The issue of cruelty

Some people argue that it is cruel to keep hens in battery cage systems (for example, subs. 26, 43, 46, 57, 87 and 103). Cruelty is a threshold question for *valuing* different states of animal welfare. If it could be established that the broad community regarded battery egg production as cruel, it would suggest a ban.

In this context, cruelty is not just a low level of animal welfare, but one which falls below what the community as a whole would generally regard as acceptable. For example, most people would regard a person beating a dog with a metal chain as unambiguously cruel. However, a simple example like this belies the complexity and subtlety of the concept of cruelty.

First, suffering is a vital element in cruelty, but it is hard to assess in animals and may tend to be de-emphasised through lack of ready measurement. Suffering extends beyond physical pain to the mental experiences of an animal. It is not clear that every aspect of suffering is manifested in physical responses (eg stress hormones).

Second, it appears that context matters for cruelty:

- People are less likely to perceive acts as cruel if the act is incidental to some other purpose. Cruelty is seen, for example, as much worse if it done needlessly, for the ‘pleasure’ of the perpetrator.

- People's standards for cruelty to animals may vary depending on the extent to which the animal's appearance or nature arouses human sympathy (for example, a baby seal compared to a rat — see Dawkins 1980, p. 8). Standards may also vary over time and across cultures.
- Restrictions on the ability of an animal to behave as it would in the wild may sometimes be viewed as cruel, even if it does not subjectively 'hurt' the animal. For example, some people would perceive it as cruel to keep an eagle in a zoo, even if it appeared contented, because it was unable to fly properly. On the other hand, denying what people perceive as an 'adverse' natural trait of an animal (such as pack hunting in dogs) will probably not be seen as cruel.
- Many people deem it cruel not to put down an animal which is suffering from a debilitating disease or neglect, but they may feel very uneasy about acquiescence to voluntary human euthanasia in similar circumstances (Dawkins 1980, p. 6).

These complexities and inconsistencies make it difficult to be unequivocal about whether battery cage production is *cruel* or not. People viewing the same facts will make different judgements. The Commission reviews some of the consumer perceptions of animal welfare in chapter 6, but does not make its own judgement on this inherently subjective issue.

However, the case for a ban does not rest on proving cruelty. The case can also be put for a ban if it is felt that the shift from battery to non-battery alternatives would raise animal welfare sufficiently to be worth the cost of doing so.

4.8 Conclusion

Different housing systems for hens have a variety of subtle and complex influences on the physical and behavioural aspects of animal welfare, which make it hard to form judgments about which is best. Animal welfare itself has multiple dimensions, such as food and water intake, illness and behavioural freedoms.

There are a variety of scientific ways of discerning whether a particular change in any *single* aspect of a hen's environment will improve or reduce welfare (Broom 1991). As a result, there is substantial (but not complete) agreement about what constitutes a better welfare outcome, *taking each dimension separately*. For example, all other things being equal, most scientists would agree that animal preference tests show that a hen with access to a nesting box is better off than one without such access.

There is reasonable (though weaker) evidence about the comparative performance of barn versus battery cage systems in *each* of the relevant dimensions (tables 4.2 and 4.4), albeit with some gaps and uncertainties (such as in corticosterone levels).

Drawing on the international and Australian studies and on information provided by participants in this study, it is apparent that *all* intensive commercial systems — battery, barn or free-range — present a number of problems in some important dimensions of animal welfare.

Battery cages allow limited potential for exercise and the pursuit of behaviours, such as nesting, dust-bathing and perching. Experimental studies reveal that hens value these highly. In contrast, barn-lay (and free-range) systems allow for the full expression of such behaviours. The incidence of fracture rates and feather pecking also appears to be higher in battery cages compared to alternatives. On the other hand, a range of physical indicators (such as mortality, sickness and egg productivity) and housing quality factors (such as temperature and dust control) appear to currently favour battery cages over alternatives.

The view about which system is best for hen welfare overall (rather than along any particular dimension) depends on the weights allocated to each dimension of welfare. Unfortunately, while laboratory preference tests can be used to see how animals trade-off some aspects of welfare for others (such as access to food with nesting boxes), they cannot be used to trade-off all aspects of welfare. For example, a revealed preference test cannot measure what behavioural freedoms a hen is willing to give up to lower the risk of mortality. Consequently, there is no simple measuring stick for *overall* animal welfare. Some people may think that the lower expected lifespan (and other disadvantages) in barn systems is too high a price to pay for the greater scope for exercise and behavioural freedoms offered by these systems. Others may see this as an acceptable price to pay.

It is important to distinguish the situation as it is now (as above) from what it is likely to be in the future. There are a number of relevant findings from the scientific research about the potential for achieving better hen welfare outcomes from each of the systems:

- *Battery cages*: While physical outcomes are already generally good, there is limited scope, without radical re-design, for changing the existing battery cage system to overcome its chief deficits. Radical re-design (which is discussed further in chapter 8) — such as modification of cages to incorporate facilities for nesting, dust-bathing, litter pecking and perches — would enhance hen welfare compared to current cages. Such modifications, however, effectively represent a whole new housing system and have not been trialed commercially.

- *Barn systems*: There are good prospects that research and learning about how to manage barn systems will improve the physical welfare outcomes for hens in these systems, such that they compare well with cages (Barnett 1998). For instance, further research may identify better housing designs or hen breeds to limit aggressive interactions.

The Commission's reading of the complex literature suggests that, on balance, the move to a properly managed barn system would provide some improvement in hen welfare, especially in the long run. However, a ban, which accelerates the shift, may require accompanying measures to maximise the potential for achieving welfare gains in the short term:

- research (coordinated by government on public good grounds) into the best strategies for control of disease and aggressive pecking;
- extension services to relevant poultry farmers to disseminate these findings;
- development of codes of practice by industry, government and animal welfare groups for the alternative systems to maximise their welfare potential, while still making them economic;
- appropriate monitoring of farms and enforcement of agreed standards by government; and
- appropriate training in the new systems for staff, including the modification of existing husbandry courses in educational institutions. This recognises that a key ingredient in animal welfare is not related to the housing system at all, but to the professionalism of the poultry farmer.

It should be noted that, in national terms, an ACT ban will not change the absolute market share held by barn systems substantially. In that sense, concerns that large numbers of operators unfamiliar with barn systems would suddenly commence production, with all the animal welfare costs that inexperienced husbandry can produce, are unlikely to be realised.

Finally, animal welfare is only one ingredient in the overall assessment of the proposed ban. Any number of changes could be proposed which would improve animal welfare, but only some of them will be cost-effective or acceptable to the community. The next two chapters examine the cost implications of the proposed ban.

5 Impacts on producers and jobs

5.1 Industry structure

Introduction

Egg production is one of the oldest forms of Australian agriculture. Production was from backyard and mixed farm flocks until the 1930s, when larger commercial flocks were established based on enclosed sheds or 'barns'.

Following their development in the US in the 1930s, intensive battery cage production systems were introduced to Australia during the 1950s, spreading throughout the industry during the 1960's and subsequently. The new production technology offered advantages in the form of higher hen productivity, lower labour requirements and the avoidance of some diseases associated with straw litter floors. Around this time, the poultry industry also separated into specialist egg and broiler producing units.

Beginning in the 1970s, and developing momentum through the 1980s, some consumers developed a preference for free-range eggs. These preferences appear to have reflected both animal welfare concerns about birds kept in a caged environment and a perception that free-range eggs were more nutritious and chemical-free. As a result, some exclusively free-range producers entered the industry and some major battery cage producers developed a free-range capacity.

More recently, there has been a return to barn production. This meets consumers' welfare concerns about the cage system at lower production costs and consumer prices than free-range production. Considerable impetus was given to the development of barn production by the entry of RSPCA-endorsed eggs.[1]

For many years, prices and production in the egg industry were highly regulated by statutory egg marketing boards. As a consequence, the industry benefited from high effective rates of assistance — in excess of 250 per cent in the early 1980s

[1] The criteria for RSPCA endorsement effectively rule out eggs produced in battery cage systems. To date, only barn produced eggs have satisfied the RSPCA criteria.

(IC 1995, p.112). Regulatory controls were largely abolished through the 1980's with the exception of Western Australia, Queensland and Tasmania (Larkin, Heilbron and Murphy 1997). Effective rates of assistance for the industry are now of the order of 6 per cent (IC 1997).

Deregulation appears to have increased the pressure on producers for structural change. By 1994, almost 40 per cent of producers in NSW who owned a quota when the industry was deregulated in 1989 had ceased production. And only 9 per cent of egg farmers that restructured their operations increased production and market share (Littleton and Davies 1994, p. 209). It needs to be noted, however, that deregulation occurred against a backdrop of generally declining per capita egg consumption (chapter 6).

While barriers to entry in egg production appear small, exit from the industry in an environment where alternative employment is not always available is more problematic. Writing in 1994, Littleton and Davies (p. 209) commented that many NSW egg producers are 'still hanging on' and eating up any capital reserves they may have. One survey placed average capacity utilisation at 83 per cent in 1991–92 (Read Sturgess and Associates 1993).[2] All in all, there seems reason to suppose that there is still a degree of excess capacity in the industry, but there is no readily available measure of its extent.

Farm size and location[3]

Over time, the two most notable trends in the industry have been the increasing size of egg farms and its mirror image, the decreasing number of producers in the industry. In NSW, for example, the number of egg producing farms fell from 3 000 in 1950 to 144 in 1996. The average number of hens per farm increased from 6 000 in 1970 to 20 000 in 1991.

At March 1996, there was a total of 526 egg producers in Australia. About 27 per cent of these farms were in NSW and about 22 per cent in Victoria. NSW had almost 39 per cent of the national flock and Victoria 23 per cent (table 5.1).

[2] However, the authors point out that 1991–92 may not be representative as it was a particularly depressed year for the industry.

[3] This section of the report draws extensively on Larkin, Heilbron and Murphy (1997) and Larkin (1993).

Table 5.1 **Number of farms and egg producing birds, March 1996[a]**

	Number of birds (millions)	*Number of farms[b]*
New South Wales	5.1	144 (201)
Victoria	3.0	118 (170)
Queensland	2.6	110 (99)
South Australia	0.8	47 (164)
Western Australia	1.3	85 (109)
Tasmania	0.3	14 23)
Northern Territory	0.1	6 (8)
Australian Capital Territory	0.2	2 (2)
TOTAL	13.4	526 (774)

[a]Totals may not sum due to rounding. [b]Numbers without parentheses are farms whose main business is egg production. Numbers in parentheses include producers for whom egg production is not necessarily the main business of the enterprise.

Source: Larkin, et al 1997.

Most farms are located near the major markets, generally within a radius of 50 to 100 kilometres of State capital cities. This reflects the relatively small quantity of agricultural land needed for egg production and the advantages of relatively short transport legs for a fragile commodity. However, some significant producers are located in grain belt areas such as the Darling Downs in Queensland and Tamworth, Young and Griffith in NSW. There is also some decentralised production in Victoria, Tasmania and South Australia.

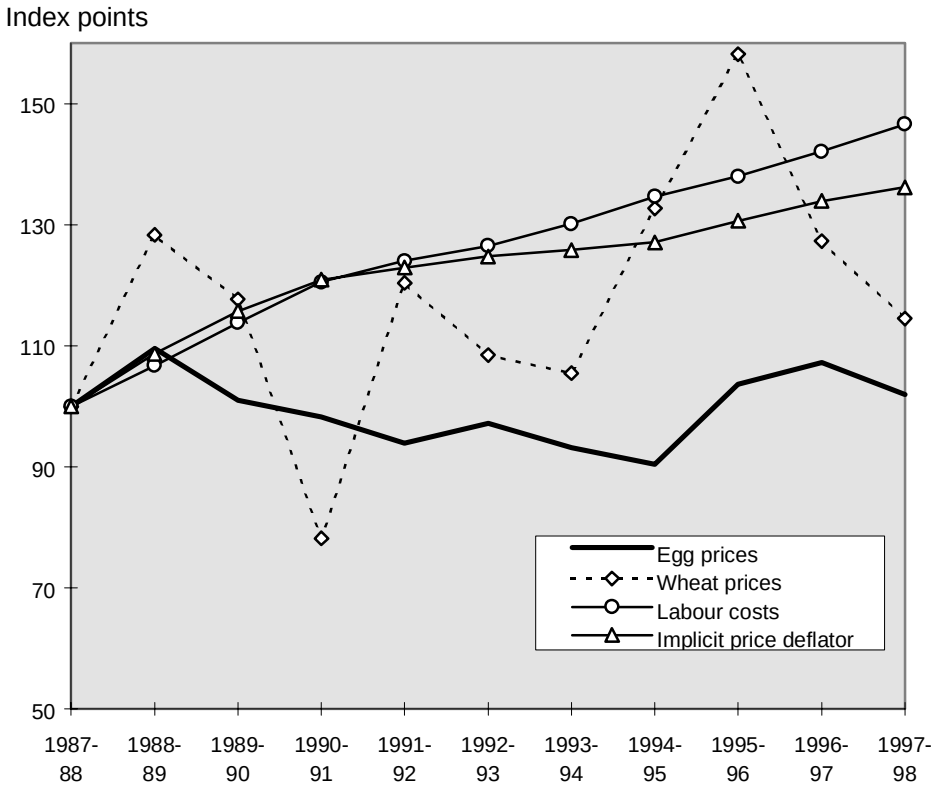
Selective breeding has dramatically increased bird productivity with the number of eggs per bird per year increasing from about 180 in 1970 to approximately 300 today. Increased output per bird has led to a corresponding improvement in bird feed conversion rates: in 1997, one kilogram of eggs required 3.5 kilograms of feed, while in 1991 it required only 2.9 kilograms of feed.

Farm gate prices and returns

From 1987–88 to 1994–95, egg prices at the farm gate exhibited a slight downward trend. After a period of recovery to 1996–97, prices fell again in 1997–98 (figure 5.1). Across the entire period, farm gate prices have been flat — the Australian Bureau of Agricultural and Resource Economics (ABARE) index averages approximately 100 over the period shown. Earlier ABARE egg price data show this flat trend extending back to the early 1980s (ABARE 1997). By contrast, price indicators for some of the industry's main inputs (wheat and wages) and the implicit price deflator for non-farm GDP show an upward trend (figure 5.1).

Figure 5.1 **Egg output prices and main input price indicators, 1987–88 to 1997–98**

1987–88=100



Data sources: Egg and wheat prices are from ABARE (*Australian Commodities* and *Australian Commodity Statistics*, various issues); labour costs are indexed average weekly total earnings, all employees (ABS Cat. No. 6302); and the implicit price deflator (IPD) is trend IPD for gross non-farm production (ABS Cat. No. 5206).

A divergence between output and input prices — the 'cost-price squeeze' — is not uncommon among Australia's rural industries. Such a squeeze does not necessarily mean lack of profitability, especially in the longer term. The 'cost-price' squeeze can be offset by improved productivity. It is, however, indicative of pressure for structural change and may therefore throw some light on the number of producers that have left the industry (see above). Moreover, there are indications that, at times, egg prices at the farm gate have been insufficient to cover full production costs. For example, Read Sturgess (1993, p. 6) note that their survey data for 1991–92 suggest:

> ... many producers failed to even recoup all their non-capital costs let alone make a return to cover capital costs and managerial skills.

Vertical links in egg production

The production of eggs can be thought of as a number of distinct stages or functions which are broadly similar for most commercial producers:

- the breeding, hatching and rearing of pullets;
- the production and collection of eggs on-farm;
- quality control, including egg cleaning and testing;
- transport from farm-gate to distributor, wholesaler or retailer; and
- distribution to the final consumer.

The extent of these functions undertaken by individual producers varies. Until the emergence of large scale specialist egg producers, most farms were vertically integrated: they grew their own feed, bred and reared their own chickens, and produced, cleaned and packaged their own eggs. But a degree of specialisation came with large scale production.

Currently, breeding of hens for egg production is dominated by four companies which account for over 90 per cent of commercial production in Australia. These companies, and some smaller operators, run approximately 25 hatcheries located throughout Australia. After hatching, day old chicks are placed in rearing facilities until they reach sexual maturity at 16 to 18 weeks old. These facilities may be integrated with the chicken hatcheries, although this is not always the case.

At, or just before sexual maturity, the hens are placed in cages, barns or on free-range farms. Layer hens are normally kept on these farms until they are about 72 weeks of age. They are then disposed of as pet food or as low grade meat.

In battery cage systems, egg collection, as well as feed and water supply, is usually automatic. In barn and free-range systems, eggs are usually collected by hand several times a day, although automatic egg collection equipment is available for barn production. Once collected, the eggs are visually examined for cracks and, where necessary, given a preliminary cleaning.

The next stage, grading for size and quality, takes place on-farm for the larger, more vertically integrated, producers. For others, grading floors are operated by egg marketing organisations. Grading floors may grade 30 000 dozen or more eggs per week.

Once graded, eggs are given a more thorough internal and external examination. Regular samples are also take to check for quality indicators such as yolk colour and albumen firmness. Eggs are then categorised as one of three qualities:

- first quality, which are suitable for marketing as shell eggs (by far the majority of eggs);
- second quality, which are suitable for consumption after processing; and
- reject eggs, which are disposed of.

The eggs are then packaged into the familiar cartons, usually holding a dozen eggs but sometimes as few as four, or as 'flats' holding up to 30 eggs.

Egg cartons display a wide variety of information including the name of the supplier, the use-by-date, recommendations for storage, content information (including the egg size, the number of eggs in the container and the address of the supplier) and, for non-battery eggs, indications of the production mode, such as 'free-range' or 'RSPCA-endorsed'. Containers may also carry other information required by law. A number of participants suggested that the current labelling of some eggs is misleading (chapter 6).

The egg cartons are boxed and palletised prior to transport. Fresh shell eggs are delivered to retailers, predominantly supermarkets, with marketing and transport from a centralised location generally being coordinated and undertaken by marketing organisations such as co-operatives, packers or agents. These organisations have replaced the previous statutory marketing boards.[4]

In battery cage and barn production systems, there is a period of about two weeks at the end of each production cycle before new pullets are brought in. This is to allow for thorough cleaning and disinfecting to control for the build-up of parasites and diseases.

Industry output and employment

National production

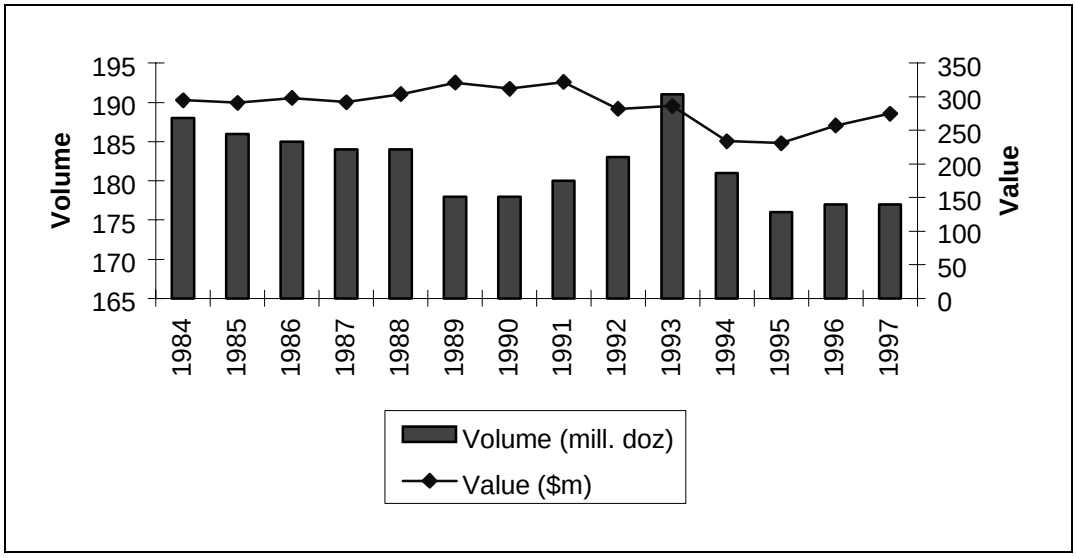
Egg production in Australia has two distinct components, commercial egg production and backyard production.

Commercial egg production accounts for by far the greater portion of total production — of the order of 90 per cent. It has declined in recent years in both value and volume terms (figure 5.2). In 1996–97, commercial production was 177 million dozen, with a value approaching $275 million. The Australian Egg Industry

[4] While not strictly part of the egg production story, fowl manure is a valuable by-product and is usually sold as fertiliser, either direct to the public or to organic fertiliser producers.

Association (AEIA) estimates that, in shell equivalent terms, approximately 3 million dozen eggs are imported in dehydrated or other processed egg forms (equivalent to about 2 per cent of commercial production) and 1 million dozen eggs are exported. Backyard production — amounting to about 25 million dozen eggs a year — accounts for the rest of the domestic supply of eggs.[5]

Figure 5.2 **Volume and value of commercial egg production, Australia, 1983–84 to 1996–97**



Data source: Larkin, et al 1997 and ABS (Cat. No. 4306 and 7501).

ACT production

The major supplier to the ACT is Bartter Enterprises (Bartter) through its Parkwood ACT property. According to Bartter, this property has approximately 210 000 hens and an annual capacity of approximately 5 million dozen eggs. This is more than adequate to meet ACT commercial demand of some 3.3 million dozen. As Bartter supplies only about 80 per cent of the ACT market, it apparently 'exports'

5 Estimates of backyard production vary somewhat. The ABS estimated that Australian backyard production was 24.8 million dozen in 1996–97, or about 12 per cent of the domestic supply of eggs (ABS 1998, Cat. 4306). The NSW Department of Agriculture and Fisheries estimates that backyard and small scale production represent 12.5 per cent of all NSW egg production (NSW Agriculture 1995, p. 4). The NSW Farmers' Association notes that, while an average of 6.6 per cent of Australian households have some backyard production, the corresponding figure for ACT backyard production is only 2.3 per cent (sub. 78, p.13). On this basis, backyard production's contribution to the total ACT egg consumption is relatively insignificant — and is likely to be around 4 per cent of the total.

substantial quantities outside the ACT — over 2 million dozen. The ACT 'imports' approximately 800 000 thousand dozen eggs.

Industry employment

Estimates of industry employment at the national level vary. Unpublished ABS data show total paid labour in the poultry industry (poultry meat and eggs) as 3 734 persons in 1995–96. Based on the relative share of egg production wages, salaries and supplements (see Larkin 1993, paragraph 5.26), this implies an egg production labour force of approximately 2 500, a figure consistent with industry estimates provided to the Commission. In addition to paid labour, the Commission estimates, based on unpublished ABS data for 1994–95, an unpaid (family) labour force of approximately 1 700.

In the ACT, 50 persons are directly employed in egg production at Parkwood (sub. 30, p. 6). ACT employment is discussed below.

5.2 Costs of egg production

Battery cage production costs

Up to date data providing a comprehensive picture of battery cage production costs are not available. However, Read Sturgess (1993), Hafi et al (1994) and Littleton and Sanders (1993) provide 'snap shots' of battery cage production in the early 1990s. Indices of costs based on these sources are reproduced below (table 5.2).

The largest single input cost for battery egg production is feed. Most producers feed their birds a combination of grains mixed with vitamin and colouring additives. Freight, contract grading and packaging account for almost 25 per cent of costs. Of this, transport is a relatively small component — of the order of 5 per cent of total costs for graded and packed eggs — although, of course, this varies with distance (Littleton and Sanders 1993). Labour (including what is often family labour) is also a significant cost. Labour is needed to inspect the birds for signs of disease, to ensure that machinery is operating properly, to clean the premises, for cleaning, packing and dispatching eggs and, depending on the extent of forward integration, for administration, sales and marketing. Capital costs (interest, depreciation and a return to owners capital and management) account for approximately 20 per cent of total costs.

Table 5.2 **Relative cost of inputs for egg production in battery cage systems**

	Read and Sturgess					
	Small farm	*Medium farm*	*Large farm*	*Average*	*Littleton and Sanders*	*Hafi et al*
Number of birds ('000)	7.5	15.0	80.0	30.0	30.0	28.3
Value of operating assets ($m)	0.439	0.840	3.828	1.651	0.950	1.070
Assumed eggs per bird per year	260	260	260	260	not known	246
COSTS (%)						
Feed	32	32	32	32	41	39
Labour	13	12	12	12	11	6
Cost of hens [a]	7	7	9	7	13	12
Freight, grading, packaging	23	23	25	24	16	22
Other variable costs [b]	3	3	3	3	1	2
Interest and other fixed costs	2	2	2	2	1	3
Depreciation[c]	8	8	7	8	6	6
Return to owners' equity and management[d]	12	12	11	12	10	10
TOTAL COSTS	100	100	100	100	100	100

a Cost of hens is net of the sale value of spent hens. **b** For example, rates, insurance, administration and water. **c** Based on Hafi et al (1994), assuming a depreciation rate of four per cent. **d** For all except Littleton and Sanders, based on Hafi et al (1994) who calculated the return as a residual after subtracting depreciation and operating costs from the operating surplus. Hafi et la's return was equivalent to 7.8 per cent of the value of fixed assets. Littleton and Sanders assumed a return of between 4 and 8 per cent depending on the nature of the assets involved.

Source: Commission calculations based on Read and Sturgess (1993), Hafi et al (1994) and Littleton and Sanders (1993).

There is some evidence of economies of scale in the production of eggs in battery cage systems. Calculations, based on Read Sturgess data, suggest that unit costs for small producers (7 500 birds) are some nine per cent higher than for large producers. The corresponding figure for medium sized producers is six per cent.

Alternative systems' production costs

Barn production costs

The Commission sought information from a number of producers on the costs of barn production in Australia — both in relation to the cost of inputs and compared to caged and free-range production — with only limited success. Information provided by one producer (table 5.3) suggests that barn production costs are some

40 per cent higher than for caged production systems, reflecting both higher feed and labour costs for barn systems. However, underlying these cost differences is a far higher mortality rate for barn and free-range hens compared to battery hens. Other information provided to the Commission indicates that these differences in mortality rates are considerably higher than industry norms. Thus, the data in table 5.3 may overstate 'typical' cost differences between battery cage and the other production systems.

Higher feed costs per egg reflect the birds' greater opportunities to undertake a fuller range of activities (flapping of wings, dust bathing and just moving around) and therefore a greater diversion of energy into non-laying activities. One important reason for higher labour costs in barns is the need to gather eggs laid outside the barns' laying boxes — in some cases, eggs are collected several times a day to avoid spoilage. The NSW Farmers' Association suggests that labour requirements are three times higher in barn systems compared to cages.

Labour costs for barn systems can be reduced by greater use of automation, albeit with some increase in capital costs. One producer advised that most variable costs are similar between the two systems, but capital costs per bird are higher for barn production (a shed on the property in question held only a quarter to one-sixth of caged bird densities). The producer considered food consumption per bird to be higher (by 10 to 20 per cent) and egg productivity per bird lower. On this property, higher hen mortality rates for barn production (compared with battery cage systems) were not a significant cost driver.

Table 5.3 **One producer's relative costs per egg for different production systems**

Cost Components[a]	*Caged*[b]	*Barn*[b]	*Free-range*[b]
Feed costs	100 (51)	118 (43)	123 (39)
Labour costs	100 (5)	353 (14)	667 (23)
Other variable costs	100 (44)	140 (43)	144 (39)
Total variable costs	100 (100)	140 (100)	162 (100)

[a]Each component is expressed as a percentage of the battery cage cost for that component. Capital costs are excluded. [b]Figures in parentheses are the percentage contribution to the total cost of each system.

Source: Derived from information supplied to the Commission.

Although now somewhat dated, data comparing costs of various systems are also available from MacIndoe (1987) and the Tasmanian Department of Primary Industry (TDPI, 1990). Their costs differ markedly from those shown in table 5.3. Data from both studies suggest deep litter (barn) production costs are only some 7 per cent higher than battery cage costs (TDPI, 1990, p. 33; MacIndoe, 1987, p. 133).

Free-range production costs

Table 5.3 suggests free-range production is considerably more costly per egg than either caged or barn production systems.[6] In part, this reflects its greater labour intensity. The NSW Farmers' Association suggests that labour requirements are five times higher for free-range systems compared to battery cage systems (sub. 78, p. 10). But other factors are also important, for example, higher free-range mortality rates also increase costs.

Other systems' production costs

Although now somewhat dated and not based on Australian data, the work of Elson (1985) shown in table 5.4 provides a guide to how costs of production vary in a number of commercial and experimental systems. The main point to note is the cost relativities between battery cage production and the 'near-barn' production systems of aviary, perchery and deep litter. The unit production costs of aviary/perchery systems are only 5–8 per cent more than battery cage costs, and that of deep litter systems, about 18 per cent more.

Table 5.4 **Production costs in different egg production systems**
(Battery Cage equals 100)

System	*Stocking density*	*Cost index*
Battery cage	450 sq cm/bird	100
Aviary, perchery and multi-tier houses	20 birds/sq m	105-108
Two-tier get-away cages	na	110
Aviary	10-12 birds/sq m	115
Deep litter[a]	7-10 birds/sq m	118
Straw yard	3 birds/sq m	130
Semi-intensive	1000 birds/ha	135-140
Free-range	400/ha	150-170

a Deep litter approximately corresponds to barn production in Australia, although the stocking density is higher than the RSPCA-endorsed 5 birds/sq metre.

Source: Elson (1985) cited in Appleby et al (1992, p. 72).

Other European studies undertaken in the late 1980s tend to reinforce Elson's findings. For example, Haartsen and Elson found that aviary costs of production were 5 per cent higher than battery cage systems, while deep litter costs were 16 per cent higher. Similarly, Tucker's results indicated deep litter production costs to be

6 MacIndoe's (1987) data indicate free-range costs of production to be in the order of 40 per cent higher rather than the 60 per cent indicated in table 5.3.

12 per cent higher than battery cage costs, and free-range production costs 52 per cent higher (studies cited in Appleby 1992, p. 75).

More recently, the European Commission's Scientific Veterinary Committee (SVC) concluded that, based on the studies available to it, aviary/perchery systems have production costs some 8–15 per cent higher than battery cage systems, with deep litter costs some 18 per cent higher. Free-range costs were 40 per cent higher (table 5.5).

Table 5.5 **Egg production costs in different systems: SVC results**
(Battery Cage equals 100)

System	*Stocking density*	*Cost*
Battery cage	450 sq cm/bird	100
Battery cage (large)	600 sq cm/bird	105
Aviary/perchery	20 birds/sq m	110
Aviary/perchery	12 birds/sq m	115
Deep litter[a]	7 birds/sq m	120
Free-range	1000 birds/hectare	140

[a] Deep litter approximately corresponds to barn production in Australia, although the stocking density is higher than the RSPCA-endorsed 5 birds/sq metre.

Source: Stevenson (1997).

Studies undertaken in Switzerland (Swiss Society for the Protection of Animals STS 1994) and by the Agricultural Economics Research Institute of the Netherlands (Van Horne 1997) show costs around 10 per cent higher for eggs produced in aviary systems compared with battery cage, although results from a survey of 17 per cent of the English laying flock showed higher cost differences. This latter study reported perchery costs 24 per cent higher than battery cage costs, while free-range costs were 40 per cent higher (Roberts and Farrar (1993) cited in Stevenson (1997)).

The information available to the Commission clearly shows that no alternative egg production system has costs as low as battery cage systems. Of the alternative systems, barn, or near barn, appear to have the lowest production costs and free-range the highest. The magnitude of the cost difference between battery cage and barn is difficult to ascertain. However, on the basis of the information available, the Commission considers that present farm production costs in Australia for barn systems are, on average, of the order of 35 per cent higher than for battery cage systems — $1.70 per dozen compared to about $1.25. These costs include an allowance for depreciation and a return to owners' equity. There are, however, two interrelated reasons why this difference is likely to fall over time:

- modern barn production is in its relative infancy, compared to battery cages, and costs are likely to fall through 'learning-by-doing' and as producers become better acquainted with European practices and technology. For example, current Australian barn production, based largely on converted sheds built for battery cages, makes relatively little use of vertical space. It therefore has relatively low bird numbers per floor area; and
- battery cage production is a relatively 'old' technology which is likely to have less scope for improvement than barn technology which is relatively 'new' and therefore likely to provide more of a pay-off from R&D. A number of industry observers commented on the greater returns that were possible from investment in barn R&D compared to research into battery cage systems.

In the longer term, it is likely that barn production in Australia will evolve into something akin to European aviary or perchery systems. This implies a narrowing of the current cost differences between caged and barn production. In this event, the cost difference between barn and cage production could decline to about 10 to 15 per cent in the longer term — broadly in line with current European differentials.

5.3 Impact of the ban on producers

The Commission's approach

Assessing the impact of the ban on producers involves comparing what would happen with the ban on battery caged production with the counterfactual — what would happen in its absence. In undertaking such an analysis it is necessary to characterise the future costs of production in barn systems .

One issue is how the costs of barn production change as the *scale* of the industry increases. This study follows that of Hafi et al (1994) which suggests that increases in the quantity of barn eggs supplied does not raise long run costs of production:

> ... it is argued that in the long run supply of poultry products ... is likely to be infinitely elastic because the intensive agricultural production techniques used in their production require little land, implying there are no long run rents to producers.

The other issue is whether technological change is likely to drive down production costs. As noted previously, there are prospects that the production costs of barn eggs (and the current difference in production costs between caged and barn production) will diminish over time.

What are the production-related issues to be addressed?

From a national cost/benefit perspective, the Commission considers the following issues to be pertinent to its terms of reference:

- the value to society of any extra resources needed to produce the eggs ACT residents will consume if the ban is introduced; and
- the cost to society of any adjustment costs from the ban (eg from premature scrappage of the Parkwood property's capital stock).

In addition, there are issues related to the impact of the ban on specific individuals — for example, on the owners of the ACT Parkwood property and on existing producers of eggs from battery cage and alternative systems.

Extra resources needed to meet ACT consumption

It is likely that the extra cost of providing barn eggs will be fully passed on to ACT consumers as higher prices. The implications of this increase are therefore discussed in the following chapter.

In addition to the extra resources needed for production at the farm level, there may be additional distribution and transport costs as a result of the ban. For example, barn production farms may, on average, be smaller than battery cage facilities and be more dispersed. Other thing being equal, this implies additional transport costs for the finished product, for feed and other inputs. However, such extra costs are likely to be small.

Adjustment costs of the ban

Taking the industry as a whole, some part of it will need to convert from battery cage to barn production if the ban proceeds. On the face of it, there are three possible sources of potential costs to society from such a conversion:

- additional investment associated with the new production of barn eggs;
- costs arising in the period immediately before the ban is introduced, as some producers commence or increase barn production and others cease battery cage production in anticipation of the change; and
- premature scrappage or redundancy of some existing battery cage production capital.

At least some of the new investment for meeting the additional demand for barn eggs is likely to initially come from the conversion of existing battery cage sheds.

This would involve some new plant and equipment, additional shed partitions and the installation of concrete floors. Estimates of the conversion costs provided to the Commission range from $8 to $10 per bird. If new sheds are built, as would be the case in the longer term, these costs would be substantially higher — of the order of $30 per bird (industry estimates and TDPI (1990, pp. 84–85)).

However, these additional investment costs would be reflected in the production costs of the previous section — and thus ultimately in higher prices to consumers. To add them to the costs of the ban would be a form of double counting.

Adjustment costs may also stem from the fact that the ban commences on a particular day, but producers must install barn capacity prior to that time. If barn production increases before the ban commences, there could be a very short term oversupply of barn eggs, with prices falling. However, this results in only temporary transfers from producers to consumers, rather than any significant net resource losses.

Some existing buildings, cages, internal plant and equipment, such as that associated with intra-farm feed, water and egg conveyancing, may become redundant as the result of the ban. Of course, to the extent that this equipment can be purchased and used elsewhere, there is no cost to society apart from the transaction costs involved (eg the cost of dismantling the existing plant and its transport and refitting at new locations).

Estimating adjustment costs of this nature is particularly difficult. The counterfactual or base line — what would happen if there is no ban — involves forecasting when the property's plant and equipment, with normal maintenance, would become redundant in the normal course of events. This is not just a matter of estimating the remaining productive life of the plant and equipment. New technologies and changing consumer preferences could make the present plant and equipment redundant, as could, for example, a decision by the ACT Government to alter land use requirements at the termination of the Parkwood property lease on 31 December 2005.

The Commission's estimate of these adjustment costs — based on the premature retirement of Parkwood's assets —is discussed below. However, it needs to be noted that the approach is likely to overstate the costs to society. This occurs because a considerable share of Parkwood's capacity meets demand outside of the ACT. In the event of the ban, that demand will be diverted to other, non-ACT, producers. Their capacity to supply this demand is enhanced by the excess capacity they currently appear to have (section 5.1). Thus, the diversion of supply from the ACT is likely to reduce early retirement of assets and employment shedding in other

states, partly offsetting the adjustment costs felt by Parkwood in the ACT. Parkwood's private adjustment costs could, therefore, be regarded as an upper bound for the adjustment costs of the ban.

Impact on the ACT producer

Bartter Enterprise's Parkwood property of 41.4 hectares is one of the larger in the industry. It has 50 employees and 210 000 hens housed in seven steel framed poultry sheds. Feed for the property is supplied from Bartter's Griffith, NSW property.

Although operating since the early 1980s, Bartter regards the property's operations as relatively modern. Egg collection and feed delivery are automated, the sheds have climate control and the property washes, grades, packs and delivers its eggs to customers. The company considers that, because of regular repair and maintenance, the property's plant and equipment is as productive as when first installed.

Bartter has advised that, if the ban proceeds, it will cease production at Parkwood (sub. 30, p. 6) and, as a result, the business would suffer a capital loss of $7 million in current terms ($5 million in 6 years time). Because of the cost and damage involved, the company considers removal of plant and equipment from Parkwood is uneconomic.

Bartter provided an independent valuation of the Parkwood property of $7.5 million as at October 1994. The assets involved consisted of:

- layer sheds and associated equipment valued at $5.1 million, or about 68 per cent of the total;
- feed storage, egg grading and associated plant and equipment, valued at $1.16 million, or about 15.5 per cent of the total;
- employee residences valued at $0.37 million, or about 5 per cent of the total;
- land (41.4 ha) valued at $0.275 million, or about 3.7 per cent of the total; and
- other (office, infrastructure and minor plant and equipment) valued at $0.62 million, or about 8 per cent of the total.

The independent valuation of Parkwood implies an asset value of approximately $36 per bird. This figure is broadly consistent with Larkin (1993, paragraph 5.20) which, based on data from the Read Sturgess survey, estimated asset replacement values for large egg producers at $36–$60 (excluding hen replacement).

The value of employee residences and the land may not have changed appreciably since the independent valuation. It is possible that their value may not change significantly over the 6 year period before the ban is implemented. On the assumption that the value of these assets can fairly easily be realised, the Commission considers it appropriate to subtract their value from Bartter's estimate of Parkwood's current value, and from its estimate of the property's value in 6 years time, making the present and future values $6.4 million and $4.4 million, respectively.

The independent valuer's figures imply that 68 per cent of Parkwood's (unadjusted) value is layer sheds and associated equipment. Applying this percentage to Bartter's estimate for the Parkwood property in 6 years time ($5 million), the estimated value of the layer sheds is $3.4 million, or approximately $16 per bird for the then 20 year old sheds. TDPI (1990, p. 89) assumes that, after 20 years, sheds are worth only 10 per cent of their purchase value. The AEIA (sub. 76, p. 30) claims that the indicative economic life of equipment in the battery cage system is 20 to 25 years. If these asset lives applied to Parkwood, they would imply a much lower value for the sheds and associated equipment than $16 per bird (given a new price of around $30 per bird). However, the Parkwood valuation is broadly consistent with the Read Sturgess (1993, p. 14) survey's average replacement value of assets for shedding per bird of $14.02 (although the average asset lives of the survey farms may differ somewhat from the Parkwood facility). Moreover, as noted above, through maintenance, sheds can retain a relatively high valuation even if relatively old.

For these reasons the Commission has used the $4.4 million estimate as Parkwood's, and society's, potential loss if the ban proceeds. In view of the uncertainty over the asset values and the surplus capacity in the industry, this 'one-off' cost could be regarded as an upper bound. It is equivalent to a cost per year in perpetuity of approximately $290 000, assuming a discount rate of 7 per cent, or a little under one dollar for each ACT resident per year.

There may be other costs to Parkwood's shareholders. For example, the effect of the ban is likely to decrease any goodwill value of the Parkwood business.[7] There is no information available to estimate this possible decrease.

[7] On the other hand, there may be some offsetting benefits for Parkwood. For example, it is possible the land site is more valuable in an alternative use, such as residential land. Moreover, there may be some gains to Bartter in NSW if they can use existing capacity to meet non-ACT demand that used to be supplied from Parkwood.

5.4 Employment impacts

In the event of a ban on cage production in the ACT, Bartter advises that 47 of its 50 staff, mainly production workers, would be redundant. These workers would be offered work at Bartter's Griffith business, but the number of staff which would take up this offer is unknown.

The net employment effect on the national economy of a ban is probably negligible. While almost certainly some of Parkwood's employees will not take up the offer of alternative employment — for example, because spouses are employed in the ACT or because they have alternative employment prospects — any reduction of employment in the ACT flowing from the closure of Parkwood would be offset by increased employment elsewhere in Australia. Indeed, because barn production is slightly more labour intensive than battery cage production, there may be a small increase in overall industry employment. On the other hand, there will be adjustment costs for those Parkwood employees who decide to take-up employment in other Bartter enterprises. These may include dislocation of friendships and family relations, as well as transaction costs of selling the family home and relocating.

5.5 Concluding comments

The introduction of a ban on battery egg production in the ACT involves two basic costs to society: additional resource costs of producing eggs from the next cheapest alternative; and early redundancy of some of the industry's capital stock. The Commission estimates that the increase in farm production costs will be of the order of 10 to 15 per cent in the longer term and that producer adjustment costs will be of the order of $4.4 million. There will also be additional adjustment costs for Bartter's Parkwood employees, but the extent of these costs is unknown.

But what of the incidence of these changes — who gains and who loses? Clearly, Bartter's employees will be worse off, although there will be offsetting gains for other members of the national workforce. The ban may result in some short term gains for producers of barn eggs, all of whom at present are located outside the ACT. However, barriers to entry for barn production appear minimal, especially for existing caged producers, and 6 years allows ample time for producers and distributors to anticipate the effects of the ban. Thus, in the Commission's view, any above normal profits for barn producers will evaporate quickly, were they to arise at all.

What will be the impact on producers of battery hen eggs outside the ACT? Given that: interstate battery cage producers provide only about 20 per cent of the ACT

market; there is a six year transition period; and the likelihood the current ACT producer will close down, non-ACT producers of battery caged eggs would appear to be likely to suffer only minor disruption and losses at most. Indeed, given that they will gain Parkwood's non-ACT market share, they may well gain overall.

What of the ACT producer? The impact on Parkwood's beneficial owners (resident in NSW) of a ban would not be trivial. They, along with the property's employees, would bear most of the costs associated with the ban that are not borne by ACT consumers. The cost to consumers of a ban is discussed in the next chapter.

6 Impacts on the ACT community

6.1 Introduction

This chapter sets out the impact on the ACT community of the ban on battery hen eggs in the ACT and of the labelling requirement. It begins by looking at the nature of the ACT market for eggs, and then makes an assessment of the impact of the ban on prices and quantities of eggs sold. The apparent costs to consumers stemming from the higher prices that are charged for non-battery eggs is then assessed. The chapter also examines how these costs affect different socio-economic groups in the ACT.

The costs estimated by following this process (see section 6.6) assume that existing patterns of egg purchases fully reveal people's preferences. However, this may not be true for a number of reasons:

- people may care not just about their own egg consumption and its associated implications for hen welfare, but also about the animal welfare impacts of others' consumption, over which they have no control (so-called 'externality' effects);
- people may be ignorant of, or have misperceptions about, hen laying conditions (assuming they care about hen welfare), and would buy alternatives to battery eggs if they were informed;
- people may not be sure which eggs are produced by battery cage methods compared to alternatives, so that they may sometimes think they are buying non-battery eggs when they are not. Disclosure of the type of eggs being purchased may increase demand for battery egg alternatives, even at existing prices; and
- there may be other obstacles to unimpeded consumer choice.

These issues are examined in section 6.6.

Finally, this report is about the public or community benefit. The public benefit may be different from the sum of the impacts on individual consumers (and producers). In particular, the overall impact on the ACT community may need to take account of other factors, including social norms. Section 6.7 examines how these can be incorporated into policy-making.

6.2 The ACT market

It is estimated that ACT residents consume about 3.3 million dozen eggs a year — either directly as eggs or as constituents of other products, such as cakes or mayonnaise (table 6.1).

Table 6.1 **Estimated egg consumption in the ACT, 1987–88 to 1998–99**

	Eggs per person per year, Australia[a]	*ACT population*	*Million dozen per year of commercially produced eggs consumed in the ACT*[b]				
			Direct household consumption	*Via cafes & restaurants*	*Via 'imported' products*	*Via ACT-made products*	*Total*
1987–88	153.0	272 129	2.66	0.37	0.20	0.10	3.33
1988–89	146.0	276 432	2.58	0.36	0.19	0.10	3.23
1989–90	142.0	282 211	2.56	0.35	0.19	0.10	3.21
1990–91	142.7	289 320	2.64	0.36	0.20	0.10	3.30
1991–92	141.0	294 674	2.66	0.37	0.20	0.10	3.32
1992–93	141.0	299 302	2.70	0.37	0.20	0.10	3.38
1993–94	140.0	301 486	2.70	0.37	0.20	0.10	3.38
1994–95	135.0	304 805	2.63	0.36	0.20	0.10	3.29
1995–96	132.0	308 251	2.60	0.36	0.20	0.10	3.26
1996–97	132.0	309 794	2.62	0.36	0.20	0.10	3.27
1997–98p	131.7	311 600	2.63	0.36	0.20	0.10	3.28
1998–99p	130.6	313 500	2.62	0.36	0.20	0.10	3.28

a Data on eggs per person in Australia are from the ABS (Cat. No. 4306) and include estimates of backyard production as well as eggs used by businesses, such as bakeries. Other sources provide different perspectives. Larkin et al (1997, p. 65), citing International Egg Commission data, suggest that Australian egg consumption per capita was rather higher at 154 eggs per year in 1993–94 (10 per cent higher than the ABS estimate). The AEIA (sub. 76, p. 4) suggests that the ABS underenumerate domestic egg production by about 25 per cent. Another ABS source, the Household Expenditure Survey (combined with price data from ABS Cat. No. 6403) suggests consumption of about 91 eggs per capita nationally. The latter excludes backyard and commercial use of eggs. Given these disparate estimates, we have used the official estimates from Cat. No. 4306. The data for 1990–91, 1997–98 and 1998–99 were extrapolated on the basis of an estimated logistic function for egg consumption per capita (E), which was $E_t = 1/(0.0083 - 0.0017 * 0.92^t)$ where t = 0 is 1987–88.

b These calculations follow the methodology of the NSW Farmers' Association (sub. 78, p. 13) and assume that total ACT consumption per capita is similar to the national consumption. This assumption is supported by the Household Expenditure Survey, which (with price data from ABS Cat. No. 6403) reveals only small differences between ACT and national consumption (95.4 eggs per capita compared to 91.3). An estimate of the number of commercially reared eggs was obtained by subtracting backyard production, which is estimated at 4 per cent of total consumption in the ACT (chapter 5). These commercially reared eggs were apportioned between the various uses described in figure 6.1.

p Preliminary data.

Sources: ABS Cat. Nos. 4306, 3201 and 3222; and sub. 78.

In Australia, egg demand per capita has been falling, as in a number of countries (Fearne and Lavelle (1996, p. 8) and Larkin et al (1997, p. 35)).

Direct household consumption accounts for the greatest proportion of egg production in Australia — with the ABS suggesting it is about 92 per cent of the value of total Australian egg supply (table 6.2). Restaurants, fast food, accommodation and other industrial use account for the remainder. The ABS acknowledges that its estimates of the share of industry usage of eggs is probably understated. Egg industry research suggests more significant usage of eggs by industry for Australia as a whole (Larkin et al 1997 and the AEIA, sub. 76, p. 4).

Table 6.2 **Disposal of egg industry output by value, Australia**

Sector of use	*Percentage of final output[a] used by different sectors*		
	ABS input-output tables 1994–95[b]	*AEIA estimate for 1998*	*Larkin et al for 1997*
Households/retail	92	70	60 – 70
Food service and institutional sectors	6.9	15	..
Restaurants, fast food and accommodation	6.7	..	8 – 20
Health (hospitals and allied) and defence	0.1	..	3 – 15
Catering, transport	..	..	1.25 – 3
Inputs into food manufacturing	1.1	15	..
Baking products manufacture	0.8	..	3 – 12
Cereals and pasta	..	..	1
Mayonnaise	..	..	0 – 4
Ice cream/dairy/baby food	..	..	0 – 0.5
Confectionary	..	..	0 – 0.5
Total domestic usage	100	100	100

a Excludes backyard production.

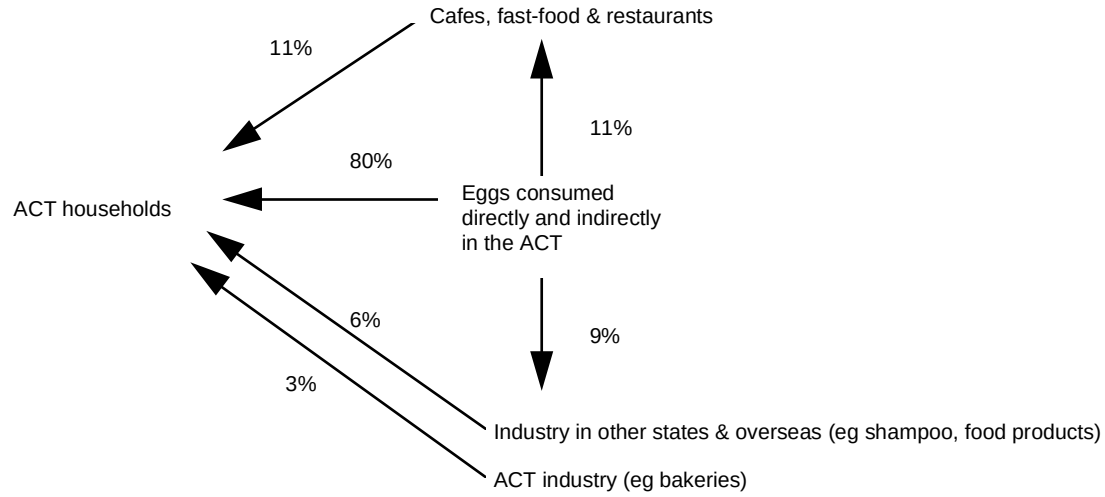
b Supply is measured as the value of total Australian production, less exports and change in inventories for 1994–95. The ABS noted that it suspects that the industry usage of eggs may be too low because the basis of the estimate was the 1986–87 input structure for the industry. It considered that subsequent changes in eating patterns would have led to more eating out, and a higher share of consumption of eggs via food service and other industries.

Sources: AEIA (sub. 76, p. 4), unpublished data from the input-output tables provided by the ABS and Larkin et al (1997, p. 72).

Market shares midway between the ABS and AEIA estimates are used for the analysis which follows (figure 6.1). A reasonable assumption is that around 80 per cent of eggs consumed by ACT households are consumed directly, while the remaining eggs are consumed indirectly, from either cafes and restaurants, or as ingredients in various industrial products (such as shampoo and food mixes, which are mostly imported from interstate or overseas).[1] This, in turn, suggests per capita consumption of around nine dozen eggs per year (from table 6.1).

1 In appendix D, we suggest that the market share (by egg numbers) of households will probably decline to around 75 per cent, as other uses of eggs increase.

Figure 6.1 **Eggs directly and indirectly consumed in the ACT**[a]



a Based on averaging the ABS and AEIA estimates of usage. It has been assumed that two-thirds of indirect consumption through processed egg goods is met by products imported from interstate and overseas.

Using supermarket data for the ACT and NSW, the NSW Farmers' Association (sub. 78, p. 13) estimates that 4.3 per cent of eggs sold directly to households are barn-lay, 9.6 per cent are free-range and the remainder are sourced from battery cage systems (table 6.3).[2]

6.3 What are retail prices now and what will happen to them?

As noted in previous chapters, the ban on battery egg sales in the ACT is most likely to shift sales to the barn-lay method, rather than the considerably more expensive free-range system. In chapter 5, the Commission estimated that the production costs[3] of a dozen 700gm barn-lay eggs are currently around 35 per cent greater than the equivalent weight of battery eggs (that is, around $1.70 per dozen compared to about $1.25 — or 45 cents more per dozen).

2 Note that sub. 78 defines the shares in terms of egg numbers, not egg values. Because of higher prices for free-range and barn-lay eggs, the market share in the retail sector of these non-battery eggs would be higher in value terms than in the quantity terms shown here.

3 Including full allowance for depreciation, a return to capital and management fees. Note that actual farm gate prices may sometimes be less than production costs in the short run, given oversupply conditions (Littleton and Davies 1994) — but these cannot persist in the long run. We do, however, take account of excess supply conditions in the current battery egg market in the calculations in appendix D.

Table 6.3 **Market share of eggs by production system, ACT, 1998**

	Share of eggs sold at the retail level[a]	*Million dozen eggs retailed per year*[b]	*Million dozen eggs sold outside retail*[c]	*Million dozen eggs sold in the ACT*	*Share of all eggs consumed in the ACT*
	%	No.	No.	No.	%
Barn-lay	4.3	0.113	~0	0.113	3.4
Free-range	9.6	0.252	~0	0.252	7.7
Battery cage	86.2	2.257	0.655	2.912	88.9
Total	100	2.621	0.655	3.276	100.0

a In comparison, the AEIA suggests that free-range eggs account for about 5 per cent of the *national* quantity of eggs, while barn-lay account for about 2 per cent (sub. 76, p. 55). Backyard production is excluded from all calculations in this table.

b The data in this column are calculated by noting that direct household consumption in the ACT is 80 per cent of 3.276 (or 2.621) million dozen eggs. The proportions in column one are then used to derive the egg volumes.

c This ignores any sales of eggs produced by free-range and barn-lay methods for commercial customers. However, aggregate sales of such eggs will be relatively small. The AEIA (sub. 76, p. 55) assumes the same.

Source: NSW Farmers' Association (sub. 78).

However, these cost differences are currently amplified by larger absolute wholesale/retail margins applied to barn-lay eggs. Data on retail prices from the Australian Supermarket Institute (ASI) suggest that the average margin between production costs and retail prices for barn eggs is somewhat higher than battery eggs (table 6.4). Thus, while the gross margin is $1.63 for battery eggs, it is $1.99 for barn-lay eggs. Grading, packaging and transport costs to destinations are roughly the same for different types of eggs.[4] This implies that the extra margin earned on non-battery eggs reflects the higher returns earned on niche products — and would also explain the higher entry rate and market growth of the barn system.[5]

ACT retail prices of barn-lay eggs are currently around 28 per cent higher than battery eggs (using ASI data) and around 35 per cent higher using the Commission survey data (appendix E). However, even if there is no beneficial technological change or learning in the barn system over the next five years, the retail price difference is likely to be smaller after the ban than now. This is because barn-lay eggs would become the most commonly retailed type of fresh egg in the ACT (like battery eggs are now). Competition between retailers and farms in this high volume market would tend to reduce barn-lay price margins towards existing battery cage

4 Although there may be some small volume effects, particularly for free-range farms, which tend to operate at much lower scale than barn-lay or battery cage farms.

5 Stevenson (1997, p. 11) has found the same for the UK.

margins — that is towards a $1.63 margin.[6] This would imply barn-lay retail prices of $1.70 plus $1.63, or $3.33. Thus, even if the relative *production* costs remain around 35 per cent higher for barn-lay compared to battery cage, the relative *retail* prices may well shrink to around 16 per cent.[7]

Table 6.4 **Indication of prices by egg type by points in the distribution chain, ACT, September 1998**
($ per dozen)

	Production costs[a]	*Supermarket buy price*[b]	*Retail sale price*[b]	*Gross margin*
Battery cage	1.25	2.38	2.88	1.63
Barn-lay	1.70	2.95	3.69	1.99
Free-range	2.15	3.35	3.85	1.70

a Production costs include variable and fixed costs, plus a normal return to the producer. They do not cover the costs of grading, packaging, transporting, holding and retailing — which, with profit margins, explains the difference between production costs and retail prices.

b The data are the average for the major supermarket chains (Coles, Franklins and Woolworths). We obtained similar data from a survey of retailers in Canberra (appendix E), albeit with slightly higher prices for barn-lay eggs and slightly lower for free-range. Selling prices may be lower when there are 'specials' and higher per egg for smaller carton sizes or specialised products (such as the Omega 3 egg).

Sources: Data provided by the Australian Supermarket Institute and producers, and calculations made by the Commission.

There are two likely future sources of reduced relative production costs for barn-lay compared to battery eggs:

- there are likely to be better prospects for technology improvements and learning in barn systems compared to the mature battery cage system; and

6 It is assumed that supermarkets and others will reduce their margins on barn-lay eggs after a ban. However, this assumption may be in error. Larkin (1993) says that retailers captured a substantial share of the gains from egg deregulation — though this may have represented a correction of previously low margins. If the assumption is wrong, it has impacts on the distribution of costs from the ban, but only 'third order' impacts on the net measure of costs. Why? At the moment, ACT supermarkets sell around 2.6 million dozen eggs a year. The gross margin earned by retailers and wholesalers (including packagers) on these eggs is about $4.3 million. If margins on barn-lay eggs did not change, they would earn a margin of about $5.1 million. The costs of dealing with barn-lay eggs in high volume are about the same as battery eggs, so the extra margin of $0.8 million would represent pure profit to the supermarkets. So long as any such profits were retained in Australia, this would represent a transfer from consumers to retailers — rather than a net cost of the measure to Australia. There would, however, be an additional impact of the higher prices on demand — but this would be slight. Appendix D explores how margins, prices and costs interact in detail.

7 However, there may be transitory fluctuations in prices away from this margin, just prior and just after the ban, as supply of barn-lay eggs adapts to the changed circumstances.

- existing barn-lay production costs are based on RSPCA standards which may not apply to new barn-lay production (for example, future stocking rates may be higher, as they appear to be in Europe).

In the analysis which follows it is assumed that, over the long run, the production cost gap declines to around 15 per cent, which appears feasible given overseas experiences (chapter 5). This (with a number of more subtle influences described in appendix D) implies that *retail* prices would be about 13 per cent higher for barn-lay compared to battery cage eggs at the time of the ban and about 6 per cent in the long run. Because of uncertainty about how costs will move, the Commission also considers a number of other scenarios, including no cost reductions for the barn-lay system.

6.4 Impact of the ban on the demand for eggs

All quantitative studies of egg demand, both here and in other developed economies, suggest that consumption of shell eggs by households does not respond much to price changes (demand is 'inelastic') — reflecting the product's unique qualities. The Commission looked at a range of quantitative estimates of the price elasticity (table 6.5), and on the basis of these has assumed an elasticity of -0.2. If retail prices of eggs increase by between 13 and 16 per cent at the time of the ban (as discussed above), then this elasticity implies that household egg demand will fall by between 2.6 and 3.2 per cent after the ban is put in place.

Given this modest quantity effect, speculation that consumers will, on the one hand, miss out on a nutritious food, or that, on the other, will benefit from lowered cholesterol, appears largely misplaced.[8]

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8 Eggs are complex foods, which are highly nutritious AEIA (sub. 76, p. 35) but have high levels of cholesterol (Appendix 5, sub. 50). The Australian Heart Foundation notes that "the richest, most commonly eaten source of cholesterol is egg yolk. A single egg yolk contains almost 200 mg cholesterol, accounting for about half the average daily cholesterol consumption in the Australian diet." It recommends moderation in consumption, even for those with currently low cholesterol levels (http://www.heartfoundation.com.au/docs/pp1.htm). Brown and Schrader (1990) found 896 scientific articles over the period from 1955 to 1987 supporting a link between dietary cholesterol and heart disease. However, they also found 39 questioning such a link. The Baker Medical Research Institute (an NHMRC block-funded Institute affiliated with Monash University and the Alfred Hospital with a special focus on cardiovascular disease) recommends reductions in dietary cholesterol, such as limited consumption of eggs, brains and a range of other foods (http://www.baker.edu.au/index.html). However, any health impacts (positive or negative) of reduced egg consumption generated by the price increases must (a) be very small since demand does not change much as a result of the ban, and (b) be qualified given considerable scientific uncertainty about the overall health impact of complex foods, such as eggs. These health issues are not considered important in the current context.

Table 6.5 **Price elasticity estimates for commercially produced shell eggs**

Study	*Comments*	*Elasticity*	*Location*
Australian studies			
Gruen et al 1967		-0.013	Australia
Banks and Mauldron 1966		-0.3	WA
Collard et al 1982		-0.3	Victoria
Hickman 1979		-0.3	Victoria and Qld
		~0.0	NSW and SA
		-0.15	Australia
BAE 1983	Estimate used in modelling welfare changes of regulations — based on past studies	-0.2	Australia
Oczkowski and Murphy 1998		~0.0	NSW, Victoria and WA
		-0.16	Qld
		-0.24	SA
Non-Australian studies			
Beck, Hoskins and Mumey 1994	Elasticity based on a previous study	-0.12	Canada
Kulshreshtha and Ng 1977		-0.003	Canada
Harling and Thompson 1985	Based on extensive literature search, and taking the highest and lowest estimates	-0.11 to -0.22	Canada
		-0.27 to -0.45	Germany
		-0.09 to -0.18	United Kingdom
Sandiford 1985		0.0 to -0.2	UK
Huang and Haidacher 1983		-0.14	US
Wohlgenant 1989		-0.09	US
Brown and Schrader 1990		-0.02 to -0.17	US
Chavas and Johnson 1981		-0.1	US

6.5 What are the welfare impacts of the ban on ACT consumers?

Direct impacts on households

Ignoring for the moment any of the anomalies identified in the introduction, the economic costs of the ban arise because people are forced to purchase more expensive eggs than they would if they were free to choose. The costs have two components:

- people have to pay a premium for the eggs they purchase. This cost is equal to the quantity purchased times the premium; and
- the number of eggs consumed falls, because eggs are more expensive compared to other goods. The cost here is the lost 'pleasure' of such consumption. This cost is quite small because egg demand is so unresponsive to price increases.

Offsetting these costs partly, existing consumers of barn-lay eggs gain from the ban, because retail margins on such eggs are likely to fall as volume rises.

The detailed calculations are shown in appendix D, including the formal framework that underlies the cost calculations. The calculations take into account:

- the likely fall over time in the price gap between barn-lay and battery eggs;
- the current trend towards non-battery eggs;
- the fact that costs are borne every year into the future;
- the ACT's population growth;
- people's preference for current consumption over future consumption; and
- falling per capita egg demand.

An estimate of the yearly cost is the constant amount of savings per year (the perpetuity) which the ACT community would have to put aside to pay for the future price premiums on eggs. This quantum is just over $520 000 per year in 1998–99 current prices (paid every year from 2005–06), or about $1.60 per person per year.[9] Of course, the actual costs of the ban are higher at the time of the introduction of the ban and lower in the future (figure 6.2). But, if the community puts aside the constant annual amount above, these costs can be met.

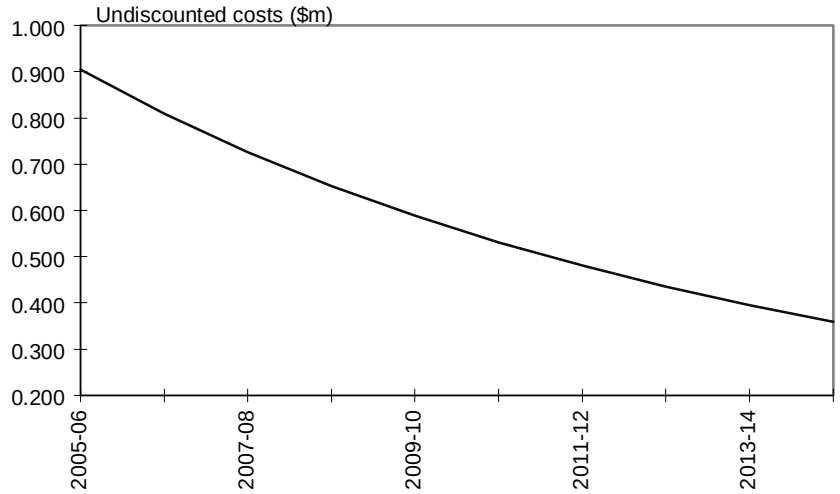
Impacts on restaurants, cake shops and other egg users

There are also a number of indirect impacts on consumers, since any price increase for battery eggs will be reflected in other products made in the ACT which use these as inputs (for example, restaurants, bakeries and food manufacturers). However, the ban relates only to fresh shell eggs and not to imported egg products, such as liquid egg or egg powder. A range of ACT businesses, such as cake shops, bakeries and industrial users, either currently use such egg products, or could do so with little difficulty. As well, the majority of manufactured products which incorporate eggs (such as shampoo) are made either interstate or overseas and are not affected by the

9 Using the projected population at that time.

ban. Therefore, the impact of the ban on firms *outside* the food service sector is effectively zero.

Figure 6.2 **Projected direct costs for households for ten years after the ban**



Data source: Commission calculations (appendix D).

However, food service providers (including cafes, restaurants, fast-food shops, hotels and hospitals) use fresh shell eggs for at least some of their products. Table 6.2 suggests that somewhere between 7 and 15 per cent of eggs are used by this sector, with the Commission's best guess being that it accounts for about 11 per cent of the ACT market. It is likely that many of these eggs are shell eggs, whose price will rise if the ban proceeds. The projected price increase per egg of around 3 cents will not significantly affect the final prices of most products. The effects are likely to be most pronounced where margins are low, such as in fast food. But even here, the overall impact on final prices are very small. For example, the price of a hamburger with egg might increase from $3.00 to $3.05, or a 1.6 per cent price increase. Overall, demand for restaurants, fast food and the accommodation sector is not likely to be significantly affected.

Even so, a proper accounting of the costs of the ban should take account of the price rises affecting indirect household consumption. Hence, it is assumed that:

- currently all eggs used in the food services sector are fresh shell eggs;
- all other eggs for industrial use can be sourced as pulp or powder from interstate; and
- the demand effects on indirect consumption are so small they can be ignored.

The Commission also takes into account how the ban is likely to affect wholesalers and retailers of eggs.

Our projections (appendix D) suggest that these total indirect costs amount to a perpetual liability of about $130 000 a year (or an additional 40 cents per resident).

Overall cost impacts on the community

To gain an overall estimate of the cost of the ban, the adjustment costs felt by producers and employees (such as the premature retirement of otherwise productive assets like sheds or packing equipment) are also included. In chapter 5, these costs were estimated as (no more than) $4.4 million as a one-off burden. Putting them in equivalent terms to the costs enumerated in this chapter, this is equal to a perpetual liability of no more than $290 000 a year. Overall, then, the total economic cost of the ban is around $940 000 per year, or about $2.85 per year per ACT resident (table 6.6). Varying our assumptions about future costs and margins over a reasonable range produces results that do not differ substantially from the above estimates (appendix D).

Table 6.6 **Summary of costs for the ACT community of the ban**

Nature of costs	*In the year after the ban*	*Perpetuity*
	$m	$m
Direct consumer costs	0.75	0.52
Indirect consumer costs	0.15	0.13
Adjustment costs	4.40	0.29
Total	5.3	0.94

A number of submissions implied higher costs than the estimates above. The NSW Farmers' Association (NFA) estimated that consumers would bear a $1.10 premium on retail egg prices (sub. 78, p. 14). Its figures imply that, if demand did not alter significantly, the additional cost to ACT consumers would be about $3.2 million per year. It argued that the cost might be even higher than this because supply shortages in non-battery eggs would elevate prices. Its calculations differ from our preferred scenario in appendix D mainly because:

- it assumes fixed retail margins;
- it does not include any potential for changes in relative production costs between battery eggs and barn-lay eggs over time; and

- by concentrating on the impact in the first year of the ban, it abstracts from other long term factors influencing the cost.

The AEIA (sub. 76) arrives at a much larger estimate of the annual impact on consumers of between $5.4 to $6.8 million (p. 25) and $4.03 million (p. 54). A minor arithmetic error affects its calculations,[10] and if corrected, while retaining the spirit of its analysis, the costing is $3.4 million per year. This cost varies from the Commission's because of a much higher overall estimate of battery egg demand in the ACT and the same differences in methodology as described above for the NFA.

Distributional impacts by socio-economic group

Because egg consumption is hardly affected by price changes, the approximate income effects of the ban on different households can be calculated using existing egg consumption data.

Data on income and consumption of ACT residents is somewhat dated, with the last ABS Household Expenditure Survey relating to 1993–94 (table 6.7). However, these data still provide a good guide to the percentage impact of the ban. The data suggest that the impact of the ban would be extremely small for all income groups and household types. However, a number of submissions (for example, the AEIA (sub. 76, p. 35) and the Northern Territory Department of Primary Industry and Fisheries (sub. 9, p. 2)) claimed that the ban would have a regressive impact — that is, a bigger proportional impact on the incomes of poorer households. This is the case, with the relative burden of the ban being 3.8 times greater for households in the bottom 20 per cent of income than average households (table 6.8). Some household types, such as low income, couple-only households, are more adversely affected than others (table 6.9).

[10] On page 25, the AEIA calculates that there are 4.836 million dozen eggs consumed by ACT residents a year, but the population and per capita figures imply consumption of 4.03 million dozen a year. On page 54, it is claimed that ACT residents consume 4 million dozen battery eggs a year, but the calculations are performed using the incorrect 4.8 million dozen figure.

Table 6.7 **Expenditure on eggs by income quintile, Canberra, 1993–94**[a]

	Lowest 20%	*2nd quintile*	*3rd quintile*	*4th quintile*	*Top 20%*	*All house-holds*
Average household per annum expenditure on eggs ($)	34.14	28.46	55.88	38.47	50.89	41.61
Average household per annum income ($)	13 282	29 439	45 278	66 909	115 045	54 109
Egg share of income (%)	0.26	0.10	0.12	0.06	0.04	0.08
Average number of people in household	2.14	2.63	2.65	3.04	3.33	2.76
Average per annum personal consumption ($)	15.94	10.81	21.06	12.66	15.29	15.08

a The consumption relates to expenditure on all fresh eggs, but excludes eggs consumed in restaurants and fast-food outlets, or as part of other products (such as cakes or cake mixes). The data are based on responses from about 437 households. Data for Australia as a whole — which are based on a much larger sample of 8 389 households— show a similar pattern.

Source: Calculations made by the Commission using the ABS Household Expenditure Survey Unit Record File.

These regressive outcomes occur for two reasons:

- egg consumption per household does not increase by much as household income rises, so the cost burden of the measure is roughly the same in absolute dollar terms for the rich and the poor — which translates inevitably to bigger impacts proportional to income for lower income groups; and
- existing consumption of non-battery eggs is likely to be higher among the well-off than lower income groups.[11] Consumers of non-battery eggs will, if anything, benefit from a price cut in their purchases as the increase in demand and competition lowers supermarket margins.

11 For example, supermarkets primarily servicing lower income groups hold relatively low stocks of barn-lay and free-range eggs.

Table 6.8 **Impacts of the ban by income quintile, 1993–94 prices**

	Lowest 20%	*2nd quintile*	*3rd quintile*	*4th quintile*	*Top 20%*	*All house-holds*
Cost increase for pre-ban consumers of battery eggs ($)[a]	3.84	2.94	6.02	3.55	4.72	4.22
Cost decrease in barn-lay eggs for existing pre-ban purchasers ($)[b]	0.06	0.10	0.15	0.21	0.27	0.16
Net increase in costs ($)[c]	3.78	2.84	5.88	3.34	4.45	4.06
Total costs of ban ($m)[d]	0.08	0.06	0.13	0.07	0.10	0.45
Costs as a share of income (%)	0.028	0.010	0.013	0.005	0.004	0.008
Share of total cost increase (%)	18.5	13.9	29.1	16.5	22.0	100.0

a The cost increase was calculated as:

$$C_i = \Delta P/P \times E_i \times (1 + \Delta P/P \, \varepsilon)$$

where i denotes the ith income group, $\Delta P/P$ is the proportional increase in the price of eggs (assumed to be 12.6 per cent at the time of the ban), E is the pre-ban expenditure on battery eggs and ε is the price elasticity of demand for eggs (set at -0.2 on the basis of econometric estimates). The expenditure on battery eggs for each income group had to be imputed. This was done in several stages. First, on a priori grounds we assumed that the income elasticity for *non-battery* eggs is quite high — of the order of around 1.5, but declining as income rises. This is supported qualitatively by Bennett (1998, p. 6) and Fearne and Lavelle (1996) who show that animal welfare concerns are positively correlated with income. We assumed that non-battery egg consumption of 2nd quintile households was 1.6 times that of the lowest quintile, of the 3rd was 1.5 times that of the 2nd, of the 4th was 1.4 times that of the 3rd and of the top quintile was 1.3 times that of the 4th. Second, we obtained data on egg prices in 1993–94 from ABS Cat. No. 6403.0 (which records average prices as $1.90 a dozen, which we take to be the battery egg price). Information on relative prices of battery and non-battery eggs from the Australian Supermarket Institute and market share data from sub. 78 suggests that non-battery eggs (including barn-lay and free-range) were 32 per cent dearer than battery eggs. Finally, this information was combined to derive the quantities of battery eggs consumed by each income group.

b Consumption quantities of barn-lay eggs were assumed to be 30.9 per cent of non-battery eggs (as in sub. 78) for each income group. These eggs are projected to fall in price by about 7 per cent because of lowered supermarket margins (see above main text), providing an income gain to current barn-lay egg consumers.

c The net cost is simply the cost from price increases faced by consumers of battery eggs less the cost decreases faced by current consumers of barn-lay eggs.

d This is the aggregate cost of the ban for each group of households — using observed prices in 1993–94 — in millions of dollars. Price increases since 1993–94 mean that the absolute costs of the ban will be greater — but the issue here is to look at costs as a share of income (the penultimate row) and the distribution of the costs among different households (the bottom row).

Source: Calculations made by the Commission using the ABS Household Expenditure Survey Unit Record File.

Table 6.9 **Net income effect of the ban as a share of income by household type and income quintile, 1993–94**

	Net cost of the ban as a percentage of household income					
Household type	*Lowest 20%*	*2nd quintile*	*3rd quintile*	*4th quintile*	*Top 20%*	*All house-holds*
Couple only	0.046	0.007	0.017	0.005	0.002	0.007
Couples with children	0.038	0.011	0.017	0.006	0.005	0.008
One parent households	0.019	0.021	0.016	0.002	na	0.014
Lone person households	0.019	0.005	0.001	0.002	0.003	0.005
Other households	0.037	0.005	0.007	0.004	0.004	0.006
Total	0.028	0.010	0.013	0.005	0.004	0.008

a The calculations follow the procedures outlined in table 6.8. It is assumed that patterns of non-battery egg consumption are determined by income quintile alone, and not by household type. Variations from this assumption will make a negligible difference to the estimates.

na: not available due to the small sample size in this cell.

Source: Calculations made by the Commission using the ABS Household Expenditure Survey Unit Record File.

6.6 Limitations of consumers' apparently revealed preferences when measuring costs

This section considers a range of information to try to assess the extent to which ACT consumers may be willing to bear the additional costs associated with the ban.

A key question is the extent to which consumers' preferences are fully revealed by their existing egg purchasing patterns. Some submissions suggested that ACT consumers are not greatly concerned about the battery cage system because overwhelmingly they purchase battery eggs. For example, the AEIA (sub. 76, p. i) said:

> ACT consumers would be denied the freedom to choose to purchase caged eggs, although approximately 90 per cent of all eggs consumed in the ACT are thought to be derived from the caged system. This is an overwhelming vote of confidence by those consumers and occurs despite a wide range of options available in terms of the source and type of eggs available for consumption.

However, there may be a variety of reasons why existing purchasing patterns may not be a good guide to consumer preferences, namely:

- information deficiencies;
- externalities; and
- other obstacles.

These are examined in turn.

Is information provision adequate?

If consumers are ill-informed about the different types of eggs, they may make purchases which do not really accord with their fundamental preferences (eg buy a pack of eggs assuming that they are non-battery cage eggs, when they are not). Their implicit 'vote' for battery eggs is, in this case, quite accidental. They may, in fact, be willing to pay more for non-battery eggs than battery eggs — the 'costs' of the ban for such people are actually economic gains.

There are two aspects of information provision which are relevant:

- consumers may lack information about the different ways eggs are produced and their impacts on animal welfare; and
- they may be unable in a retail outlet to distinguish between eggs produced by different modes (the 'labelling' problem).

Information on egg production systems

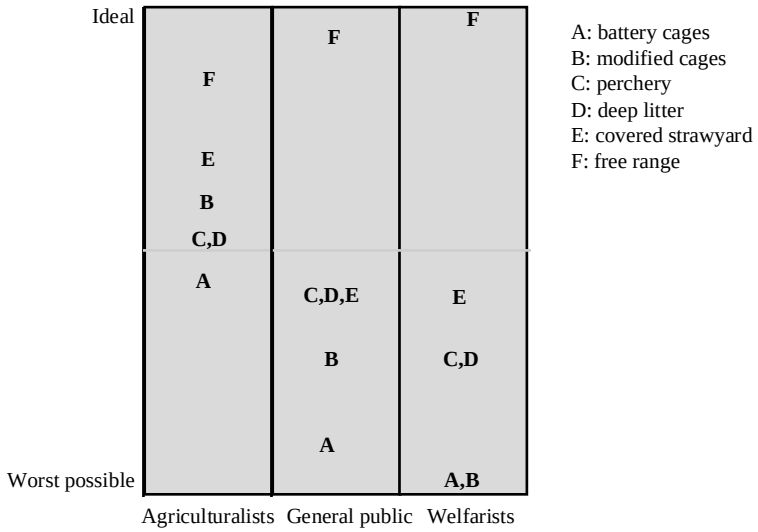
While MORI (1998) has conducted a recent survey of awareness of the different forms of production systems in the European Union[12], the Commission is unaware of any similar survey for Australia. Nor has any survey fully probed the extent of community perceptions (and understanding) of the welfare impacts of each of the different housing systems, with the possible exception of Rogers et al (1989) for the UK.[13] Their study was based on a small sample of people, split into three groups: agriculturalists, welfarists and the general public. Respondents completed a questionnaire on their perceptions of the impacts on relative hen welfare after

[12] The poll suggested that virtually all British respondents were aware of free-range and battery cage production, but less was known about deep litter and perchery/barn systems. In Germany, 78 per cent had heard of the battery system and 75 per cent of the deep litter system. In France, knowledge of free-range and battery systems was higher than the alternatives. Italian respondents had the lowest awareness of the different systems.

[13] Cited in Appleby et al (1992, pp. 98-99).

watching a video of the relevant features of six housing systems (battery cages, modified cages, perchery, deep litter, strawyard and free-range). Each group ranked battery cages last and free-range first, although agriculturalists saw all systems as at least adequate (figure 6.3).

Figure 6.3 **Overall ratings given to different housing systems**



Data source: From Appleby et al (1992, p. 98) citing Rogers et al (1989).

In Australia, an AGB McNair Survey, held in March 1994, of the attitudes of 1087 randomly selected Australians, showed that a significant number of people were aware that battery cage production involved relatively cramped conditions for birds, so that there is at least a partial (if somewhat biased) public awareness of animal welfare impacts in Australia. However, if results from the European MORI survey are typical here, few people are aware of the barn-lay system, while most are aware of free-range. The implications of these information deficiencies are twofold:

- In some cases, adverse public perceptions of the cage system and positive perceptions of the battery alternatives are not based on objective evidence. For example, concerns about food safety in battery cages relative to non-battery alternatives are misplaced (chapter 7). As well, *all* housing systems have some adverse animal welfare impacts. There are grounds for providing objective information to the public about the welfare and other relevant impacts of any production system — which may entail greater disclosure of outcomes than is currently routine (for example, in relation to mortality rates).
- If the ban proceeds, it may be important to increase public knowledge about the barn-lay system, which appears to be the appropriate successor to cages on economic and animal welfare grounds.

Labelling

At the moment, information about the mode of production (as distinct from other special features of the product, such as the grain type of the feed) is provided on the some egg cartons. It either indicates that the eggs are produced by a method endorsed by the RSPCA (currently only barn-lay eggs) or that they are free-range. If the mode of production is not specified, it can be presumed that the eggs have been produced using the battery cage method. The latter may be labelled as 'farm fresh eggs', and some display drawings which may imply non-cage production to some consumers. An important issue is, therefore, the extent to which consumers can discriminate between different egg production systems at the supermarket.

Animals Australia (sub. 82, pp. 16–17) indicated that it had made several (successful) representations before the Australian Competition and Consumer Commission concerning misleading labelling, but noted that:

> Unfortunately the accurate labelling and provision of information on hen housing has not yet occurred in regard to battery-sourced eggs ... To our knowledge no battery egg cartons marketed in Australia indicate that the eggs are from hens kept in cages.

The AGB McNair Survey for Australia appears to over-estimate free-range consumption, which would be consistent with some degree of consumer inability to discriminate between different eggs.

European surveys also suggest that consumers are confused about the production system implied by a label. For example, in the UK, a NOP (1997) survey held in August and September 1997 suggested that 35.5 per cent of people mistakenly assumed that eggs with a 'fresh eggs' label came from a free-range system, while another 12 per cent were unable to deduce the source of the eggs. The UK Farm Animal Welfare Council (1997, p. 29) recommended that it be compulsory for British eggs to be labelled according to their system of production.

It is highly probable that some ACT consumers are also unaware that they are buying eggs from the battery cage system.

Are there externalities?

People may care not just about their own consumption of eggs — and what that entails for hen welfare — but also about other people's egg consumption. For example, a person who dislikes the conditions under which battery eggs are produced may feel adversely affected if *other* people consume such eggs. This is the economic problem of 'externalities'. A ban, by removing the 'externality', makes that person better off.

Bennett (1997b, p. 243) argues that:

> The negative animal welfare externalities (animal suffering) associated with the production of animal products and services do not explicitly feature in the markets for animal products and so remain as hidden costs. An important aspect of these externalities is that the preferences of people not buying goods in markets are not considered. For example, consider the market for veal produced by keeping calves in crates. The preferences of people that consume veal are recorded in terms of the quantity they are willing to buy and the price they are willing to pay. But there may be people in society [who do not eat veal] who experience considerable disquiet about the use of calves in this way which reduces their (human) welfare and so imposes a cost on them (and hence, within a cost-benefit analysis framework, on society). These people have no way of expressing their wants through the market system.

It is even possible that some people who knowingly buy battery eggs would prefer to see a ban. They may continue to buy battery eggs because they reason that their own purchasing decisions make almost no difference to animal welfare, whereas coordinated purchasing decisions (via a ban) do so.

Of course, just because some people dislike battery cage farming is not sufficient grounds for a ban. But it does mean that consumer preferences, as reflected in the purchases of different sorts of eggs, will not give a full guide to people's valuation of hen welfare — and that hen welfare outcomes under a free market system are unlikely to be optimal.

A critical question for policy is how big are these externalities? Unfortunately, measurement of externalities, when they are in this form, is very difficult. Consumer surveys which attempt to value such externalities by asking people hypothetical questions about their willingness to pay — so-called contingent valuation — suffer from a range of limitations (see, for example, Hausman 1993). Even so, contingent valuation remains the most widely used method for trying to estimate the values of externalities and public goods.

However, no appropriate contingent valuation exercise has been conducted in Australia relating to a ban on battery cages. There has, however, been a contingent valuation survey conducted in the UK (box 6.1)[14] and a more general consumer survey relating to hen welfare in Australia (box 6.2).[15]

[14] There are a number of other British surveys with similar qualitative outcomes (Fearne and Lavelle 1996; NOP 1997 and MORI 1997).

[15] Bowling (1989, p. 79) describes an earlier survey conducted in Australia in 1983 by the *National Farmer* magazine, which showed that the majority of people disliked the thought of eggs being produced by battery hens.

The evidence from these surveys — while obviously subject to significant drawbacks — suggests that there is a degree of community unease about the conditions facing battery hens. Such views suggest that at least some of the apparent costs of the ban may 'buy' corresponding consumer benefits (both in the ACT and among others in Australia who dislike the battery system). If community unease about battery caged hens is combined with ignorance about which eggs are produced under which system, or if people do not act because they feel their own isolated contribution is too small, then existing patterns of purchases may not reveal people's true preferences.

On the other side of the coin, while there are benefits to some consumers from a ban, stemming from moral convictions about animal welfare, it is possible that:

- there are also costs to some consumers from the ban relating to moral convictions about the freedom of individuals to choose, and exercise their freedom;
- some consumers with a hostile perception of the battery cage system are unaware of the welfare disadvantages of the alternative housing systems, and the complexities of the welfare trade-offs between the two. Some consumers, when made aware of these complexities, may not consider the welfare gains to hens worth the price; and
- some consumers may view the *overall* hen welfare benefits from a ban to be low because the measure only relates to the ACT, which accounts for about 2 per cent of the total Australian egg market. On the other hand, such consumers may also view a local ban as a positive start of a wider process of legislative change relating to hens.

Are there other obstacles to consumer choice?

There may be a number of other obstacles to consumers making choices about purchasing eggs in a way that reflects their genuine preference (both for eggs and hen welfare).

One obstacle may be lack of easy access to non-battery eggs. This is unlikely to be a significant problem now that demand for non-battery eggs has risen. The Commission undertook a survey of a range of supermarkets in the ACT (appendix E). This showed that free-range and barn-lay eggs were widely available. Of course, some consumers looking for particular carton and eggs sizes of non-battery eggs will not find them in their local shop, and this may be a factor in their purchasing decision.

Box 6.1 **A UK survey of consumer valuation of hen welfare**

Bennett (1996, 1997ab, 1998) received responses on hen welfare from 591 British households during 1995–96. Consumers were asked to give a rating on the acceptability of battery caged hens, with 1 being completely unacceptable and 10 being completely acceptable. Fifty eight per cent of respondents gave a rating of one, and 76 per cent a rating less than 5. Just under 80 per cent of respondents supported legislation to phase out the use of cages in egg production in the European Union by 2005. On the other hand, 1.5 per cent of respondents objected to the legislation.

Bennett also assessed people's willingness to pay to support legislation to ban battery cages. He found that, on average, people were willing to pay about 43 pence (about $1.20) more for a dozen eggs to support the legislation, or about a 30 per cent increase in the retail price of eggs. He found some evidence of biases in the responses which overstate people's willingness to pay, and derived an adjusted mean willingness to pay of 38 pence.

Bennett also found support for the notion that part of people's willingness to pay for a ban was the satisfaction of knowing that other people would not be reducing hen welfare by consuming battery eggs — which accords with the externality argument. Thirty two per cent of respondents gave this a rating of 10 — "very true of their feelings"' and 72 per cent gave it a rating of 5 or more.

While Bennett's results are interesting, there are a number of limitations:

- the survey had a 30 per cent response rate, which raises the problem of non-response bias. It seems probable that people who are indifferent to animal welfare would be less likely to respond, and that, therefore, the responses exaggerate concerns about animal welfare among the general population.
- there are (as noted in the main text) methodological difficulties with contingent valuation which suggest cautious interpretation, as Bennett also acknowledges (1998, p. 9); and
- the question arises as to whether a survey of British consumer sentiments is relevant to Australia. While the exact numbers would have limited relevance, similarities in cultural beliefs suggest that a common qualitative pattern of results may be replicated.

Source: Bennett (1996, 1997ab, 1998).

Another potential obstacle may be people's inability to effectively voice preferences because they are buying products which incorporate eggs, such as commercial cakes or a fast-food hamburger. Clearly, it would be possible for such businesses to offer customers a non-battery alternative, but this is unlikely if demand for the alternative is low, or if it is difficult for the customer to tell whether the 'right' egg has indeed been used. However, a ban may not make a substantial difference to this problem, because many businesses will sell imported products which incorporate egg pulp from battery hens.

Box 6.2 **AGB McNair survey of attitudes to hen welfare**

An AGB McNair Survey into the attitudes of a 1087 randomly selected Australians to egg purchases and hen welfare was conducted in March 1994 as part of a routine omnibus survey. The fact that it was an omnibus survey (in which people are asked a whole range of often unrelated questions) reduces the risk of non-response bias. [16]

Forty one per cent of respondents purchased free-range eggs, which does not accord with other market share data.[17] This implies either a biased sample (which is unlikely given the survey design) or some degree of misunderstanding or deception by respondents. Misunderstanding might point to problems with consumer information, while deception suggests a degree of stigma attached to admitting to the purchase of battery eggs. Thirty seven per cent of respondents said they bought battery eggs and 27 per cent said they did not know (most of whom presumably are buying battery eggs).

When asked whether they had any particular concerns about the conditions of battery hens, 53 per cent of respondents nominated some concerns, 46 per cent had none and 1 per cent did not state or know. Of those who were concerned, the most common source of concern was a perception of cruelty (43 per cent of concerned respondents and 23 per cent of all respondents) and a distaste for the cramped conditions and/or a feeling that birds should have more space to move (41 per cent of concerned respondents).

Thirty three per cent of respondents strongly agreed (a rating of 7) with the statement that the conditions of battery hens are deplorable and that legislation should ban this mode of production. A further 11 per cent gave a rating of 6 to the statement. Seven per cent strongly disagreed with the statement (a rating of one).

About 33 per cent of people said they would be willing to pay more than 50 cents more per dozen to fund the cost increases required to provide hens with more room to move around.

Source: AGB McNair (1994).

16 Even so, some aspects of the survey may engender bias. For example, people were asked to rate their degree of agreement with the statement made by some people that "The conditions that battery hens are kept in are deplorable and that there should be laws to stop it". Such questions can 'condition' responses.

17 The data could be at least partly reconciled if people who bought free-range tended to buy smaller quantities in any given period, if people recorded that they purchased free-range eggs when they sometimes bought free-range and sometimes bought battery cage eggs, and if backyard free-range production was included.

6.7 Stepping outside individual consumer preferences

There are two ways of looking at consumers. One way is to look at them individually — with their distinctive preferences — and determine the impacts of the proposed measures on them as a whole by adding up individual impacts. This approach, adopted above, takes into account the value of battery cage alternatives revealed by *individuals* (whether motivated by ethics, aesthetics or other considerations).

A second approach uses other methods to see what the 'community' values. This may differ from the aggregate of consumer preferences because what any given individual reveals may be in breach of community or other ethical standards. For example, a man may be beating his dog next door, and may consider that this is right or (if sadistic) even pleasurable. His neighbours might not know or even care that he is beating his dog — so they don't suffer 'psychic' damage from his behaviour. A 'preference-based' benchmark for evaluating his behaviour might conclude that nothing should be done to stop the beating since he is revealing his preferences and not imposing any 'costs' on the neighbours. But many people will feel unhappy with this conclusion.

First, they will say that the 'community' has ethical standards which provides guidance about what is right. Many people might not observe those standards (eg by stealing, acts of cruelty, being inconsiderate, beating their spouses or lying), but the community does not defer to their individual preferences.

Second, the context in which ethical preferences are elicited makes a difference. In the case of battery eggs, people may shop one way (with their consumer hat on) but vote another way (with their moral or political hat on). It is important to take note of both sets of preferences when trying to make judgements about what people want.

Third, some people argue that animals have rights too. They do so for several reasons. It could be argued that not giving animals rights leads to standards of animal care which are harmful to people (that is, cruelty to animals psychologically hurts people too). It could also be argued that animals have rights which are quite independent from the human impacts or perceptions of animal welfare. How extensive these rights are, and how they are traded-off, if at all, across species is a very difficult issue. For example, do animals have the right to avoid cruelty, or do they have more profound rights, such as the right to express all their natural capabilities?

Singer (1995, p. 19), for example, argues that the fact that animals share some key attributes with humans defines some rights:

> To avoid speciesism we must allow that beings who are similar *in all relevant aspects* [our emphasis] have a similar right to life — and mere membership in our own biological species cannot be a morally relevant criterion for this right. Within these limits we could still hold, for instance, that it is worse to kill a normal adult human, with a capacity for self-awareness and the ability to plan for the future and have meaningful relations with others, than it is to kill a mouse, which presumably does not share all of these characteristics; or we may appeal to the close family and other personalities that humans have but mice do not have to the same degree; or we might think that it is the consequences for other humans, who will be put in fear of their own lives, that makes the crucial difference; or we might think it is some contribution of these factors, or other factors altogether.
>
> Whatever criteria we choose, however, we will have to admit that they do not follow precisely the boundary of own species. We may legitimately hold that there are some features of certain beings that make their lives more valuable than those of other beings; but there will surely be some nonhuman animals whose lives, by any standards, are more valuable than the lives of some humans.

However, given the enormous heterogeneity in the expression and interpretation of ethical standards, how can they be a guide to whether a ban on battery caged hens is right (or in the public interest)? Almost any conceivable action could be deemed unethical using some standard. To be useful for policy, there has to be some ability to discriminate between competing ethical claims. For example:

- How does one weigh up the ethical value of freedom and choice by humans, and the ethical requirement to care appropriately for animals?
- What does an ethical concern for animals entail?

There are several pointers to standards with a broad public appeal. First, the community may have expressed its view as part of the political process, as for example, in the Swiss plebiscite on keeping hens in battery cages (see appendix C), or the decision by elected representatives, in the case of the ACT Legislative Assembly.

Second, there may be broad community standards which may be thought to apply:

- One relevant standard is the imperative not to be cruel. *If* the battery cage system was perceived to be cruel by many people, then it would be consistent with our general ethical standards to ban production using this method. However, it should be emphasised that people making a judgment of cruelty should indicate on what grounds cruelty is taking place, and whether the alternative system is free of that cruelty. For example, many people might see beak trimming as a cruel part of the life of a battery hen. However, it is just as much a feature of the

life of barn-lay and free-range hens, and cannot therefore constitute logical grounds for a ban on the battery cage system.

- The moral standards which underlie human rights may logically extend in some cases and in some ways to animals (as maintained by Singer (1995)).

In summary, the ethical dimensions of the proposed animal welfare measures suggest that policymakers have to consider social norms as well as individual preferences when determining policy that is in the 'public benefit'.

7 Other issues

7.1 Introduction

The guidelines applying to public benefit tests set out in the Competition Principles Agreement and the terms of reference for this study indicate the need to examine factors beyond those affecting hen welfare, consumers and the egg industry itself. The following three sections of this chapter look at some of those factors — namely, consumer health, environmental and occupational health and safety issues.

A key factor bearing on the discussion about hen welfare is also relevant to these issues. More specifically, the competency of management — rather than the nature of the egg production system — is often the major factor influencing the performance of egg producers. Thus, poor outcomes are far less likely in well-managed establishments, irrespective of the egg production method employed. Indeed, some of the consumer health, environmental and occupational health and safety concerns identified in this chapter may only materialise on relatively rare occasions where management practices are 'bad'. In these circumstances, it is most appropriate to stand aside from management practices and focus on the *potential* for these problems to develop in each of the major egg production systems (ie the relative risks attached to each system).

The final part of this chapter (section 7.5) examines some cost factors — administration, enforcement and compliance costs associated with the ACT legislative amendments.

7.2 Human health

The contents of an egg would appear to be well protected from infection and disease by its shell. However, the shell is porous. Hence, there is a possibility that bacteria and viruses can pass through the shell and enter the egg. This gives rise to some human health issues, the most significant of which is *Salmonella*.

Currently, Australian eggs are free from the more severe strain of the bacterium, *Salmonella enteritidis*, but it may present a future health risk to Australians. US

experience suggests that *Salmonella enteritidis* requires medical care in 6 per cent of cases, and results in death in one in every two thousand infected people (Hoffert 1998).

There are two transmission routes for egg-associated salmonellosis, with differing implications for risk management and egg production systems:

- Most types of *Salmonella* live in the intestinal tracts of hens and can be transmitted to humans through faecal contamination of the egg shell. The risk can be reduced by minimising contact between eggs and hen faeces. This can be fairly easily achieved in a battery cage system, where the egg is separated from the hen immediately after is it laid. This is not necessarily the case with barn-lay and free-range systems. Eggs produced in these systems can come into contact with faecal material in nests. Nonetheless, normal good management practices can reduce the risk of contamination. In this context, the AEIA claimed:

  > The risks of contamination arising from *Salmonella* are considered to be greater in floor based systems than the cage system. ... The risk can be overcome through strategic placement of nest boxes and regular replacement of litter material. (sub. 76, p. 16)

  As well, clearly dirty eggs will typically not be sold as shell eggs, but powdered or pulped and pasteurised, again limiting the risks.

- *Salmonella* infection can also infect the ovaries of apparently healthy looking hens and contaminate the eggs *before* the shells are formed. This is now regarded as the prime mechanism for infection in the US (American Centre for Disease Control, 1998). Control of faecal material on eggs clearly does not remedy this problem — and therefore confers no advantage to battery eggs over alternative systems for management of this source of the infection. A range of preventative measures, such as adding lactose to drinking water, can help build resistance in hens to *Salmonella enteritidis* infection (Barnett and Newman 1997) and is equally applicable to all production systems. Similarly, recent technical innovations, such as pasteurisation of unbroken shell eggs, vaccination and new pharmaceutical approaches, can also be used to manage the risks for all production systems (Hoffert 1998).

Other human health concerns relate to antibiotics and pesticides. For instance, some participants expressed concern about the likelihood that antibiotics fed to hens would contaminate the egg and lead to human health consequences. Perceptions of whether this would be mainly a problem in battery cage systems or in alternative production systems varied. For example, the AEIA stated:

> Because there is greater reliance on the use of antibiotics as a preventive tool in floor [barn-lay and free-range] systems, eggs from such systems are also prone to contain higher, but still generally relatively low levels, of pesticides[*sic*.]. (sub. 76, p. 17)

On the other hand, a number of submissions (subs. 29, 33, 45, 77 and 86) alleged antibiotic contamination was a significant risk in battery eggs. For example, Animal Liberation stated:

> ... there is no question of the relationship between the high level of physical and emotional stress in battery hens and the routine dosing of battery hens with antibiotics ... Hens who are routinely dosed with antibiotics pass those antibiotics on to consumers in their eggs. ... In all intensive egg production systems, there are human health concerns if hormones are fed to hens to enhance egg production. ... We do not know whether Parkwood hens are subjected to any hormone treatment to enhance egg production. However we understand that the practice is not totally foreign to battery egg producers. (sub. 33, pp. 12–13)

A submission on this issue received from the National Registration Authority for Agricultural and Veterinary Chemicals (NRAAVC) clarified the use of antibiotics and growth stimulants for egg laying hens in Australia:

> Antibiotic growth promoters are not likely to be used in the egg industry. The major growth promoters avoparcin, virginiamycin and zinc bacitracin are not registered for use in egg laying birds. ... Over the years numerous poultry vaccines have been developed to prevent disease. Antibiotics are only used in the egg industry in the unfortunate occurrence of an outbreak of disease. (sub. 34, p. 1)

The NRAAVC indicated that a number of antibacterials are administered in feed or water as therapeutics during disease outbreaks, or in some cases as a preventative measure. However, their administration is not routine. The Commission has seen no credible evidence to suggest that the use of antibacterials is greater in battery cages, or that existing levels of use pose threats to humans.

Appropriate farm, transport, storage and retail management practices, rather than the type of production system, appear to be the key means of minimising human health risks associated with egg consumption. The risks are low in all egg production systems. However, what risks there are, are probably higher in non-battery farms (ARMC 1994, p. 140).

It should also be noted that retailers and egg producers have strong incentives to avoid any production system which has clear adverse impacts on human health. All three commercial systems are used in Australia with official sanction and the implicit endorsement of producer bodies and retailers.

The Commission does not consider human health concerns can form a basis for deeming any production system more desirable than others.

7.3 Environmental matters

Possible environmental concerns relate to land degradation, pollution of ground and surface waters, dust, waste disposal and odour:

- *Land degradation* could, in principle, occur in free-range systems through over-grazing leading to denudation of ground cover. Land degradation could also occur if there was nitrate leaching of the soil as a result of hen faeces left on the ground. However, in practice, normal management practices (eg rotating stock between paddocks and avoiding over-stocking) will usually prevent the occurrence of such problems.
- *Pollution of ground and surface waters* is clearly more of a problem with free-range production where hen manure can enter water ways during heavy rain. Any denuding of the bird's range areas clearly adds to this problem.
- *Dust* could, in some circumstances, present environmental problems in free-range systems if the ground becomes sufficiently denuded. (In deep litter systems, dust can also cause respiratory problems for hens and, for employees, may pose an occupational health problem (see below).)
- *Waste disposal* is not a serious problem in caged systems. As poultry manure is in demand as a fertiliser, it can usually be sold. Those egg producers that engage in other farming activities have some scope to use the manure to improve their pasture. However, as discussed above, disposal of manure is more difficult for free-range farms and barn producers as their birds' manure is not as readily disposed of as fertiliser.
- *Odour* could, at times, create a problem (eg the AEIA suggests a possibility of odour during wet weather), but the limited information available to the Commission suggests that this is unlikely to represent a serious concern.

7.4 Occupational Health and Safety

The major occupational health and safety concern relates to possible ammonia and dust-related problems in deep litter systems.

Battery cage systems typically have concrete floors, no litter and, as a result, relatively low dust levels. However, submissions to this study and other available information (eg Temple 1994 and Appleby 1992) suggest that there are higher levels of dust (and ammonia) present in systems with litter — such as barn-lay. For example, the Swiss Society for the Protection of Animals (1994, p. 31) noted that Swiss non-battery housing had higher dust levels and, as a consequence, higher

germ and other micro-organism counts.[1] Similarly, von Wachenfelt (1993) in the case of Sweden, and Groot, Koerkamp and Drost (1993) for the Netherlands, found concentrations of ammonia and dust levels higher in alternative non-cage systems. As Barnett and Newman (1997, p. 395) sum up:

> There seems to be widespread agreement that dust levels and ammonia concentrations (and possible human pathogens such as fungi, bacteria and endotoxins) are generally higher in non-cage systems ...

Ionisers, foggers, litter replacement and other management practices can lower dust and ammonia levels (Barnett and Newman 1997, p. 395). Automatic egg collection systems can reduce worker exposure and face masks can act as filters. The Commission is aware of no evidence that any system of commercial egg production — caged, free-range or barn — poses significant occupational health and safety risks.

7.5 Administration, enforcement and compliance costs

The proposed ban and the associated labelling requirements will entail some additional administration, enforcement and compliance costs. Some of the costs are 'one-off' implementation costs, while others are ongoing costs.

Additional costs stemming from the ban

Establishment costs would include the cost of preparing the relevant legislation (eg drafting costs) and the costs associated in obtaining an exemption from the Mutual Recognition Act. There would also be costs involved in informing the local community about the ban and its implications for egg prices at the time the ban came into force (ie six years after an exemption to the Mutual Recognition Act is gained).

The ACT Government provided some information and estimates about additional ongoing costs it faces. These include additional inspection costs should Parkwood convert to non-battery egg production. Information was provided for two scenarios:

- Parkwood converts to an aviary or barn system capable of accommodating its current stock levels. The Government estimates that this would require 44 full day inspections per year (up from 2 half-day inspections for the existing battery cage facility), with additional inspection costs amounting to around $20 000 per

[1] However, the same publication also notes that dust (and therefore micro-organism levels) can be reduced by frequent changes of litter, having fine sand for dust bathing and the use of water atomisers.

annum. According to the ACT Government, this would require extra resourcing for the ACT Government Veterinarian.

- Parkwood converts only its existing sheds to an aviary or barn style, providing housing for 70 000 hens — about one-third of the existing number. This is estimated to increase annual inspections to 14 full day inspections per year, with additional costs in the order of $6 000.

On the other hand, if the ban is implemented and Parkwood ceases business in the ACT, these estimates imply cost savings of around $450.

If implementation of the ban proceeds, enforcement procedures will need to be put in place to minimise the possibility that battery eggs will be misrepresented and sold in the ACT market as barn-lay or free-range eggs. This may require random inspections and/or audits of egg suppliers.

Compliance costs borne by producers (eg capital losses) are addressed in chapter 5.

Additional costs associated with the labelling requirements

The ACT Government indicated that additional one-off costs would include:

- preparing the regulation to create the prescribed expressions to be used on egg cartons (salary costs of $6 500 or more);
- preparing an information pamphlet ($100); and
- advertising in newspapers ($250 or more).

The Government would also face some enforcement costs (ie ensuring that eggs are labelled in accord with the regulation).

Egg suppliers would have to label egg cartons to indicate the manner in which eggs have been produced. They may also wish to label egg cartons destined for other markets differently (eg to exclude the prescribed expressions required for eggs sold in the ACT). However, in view of the quite extensive labelling that currently exists on non-battery eggs, it is unlikely that this would impose significant extra costs on producers.

7.6 Summing up

On the basis of the available evidence, it seems unlikely that any of the major egg production systems currently used in Australia — battery cage, barn-lay and free-range systems — would, in the normal course of events, lead to any human health, environmental or occupational health and safety problems. It appears that any problems arising in these areas are more likely to reflect poor management which, in turn, could be associated with any type of egg production system.

While the issue is not clear cut, the balance of information suggest that the *risk* of a problem arising in these areas, albeit minor, is higher with barn-lay and free-range systems than it is with battery cage systems. Nonetheless, in the Commission's view, the level of risk is clearly acceptable given the present low incidence of recorded problems relating to human health, environmental and occupational health and safety.

If the ban and the associated labelling requirements are implemented, there would be some increase in administration and enforcement costs borne by the ACT Government. If Parkwood acts in accord with its current plans and ceases production in the ACT, enforcement would probably represent the largest cost. Although it is not clear how big this would be, the Commission considers it would be small relative to the costs borne by consumers (chapter 6).

8 Policy options

8.1 Introduction

The ACT legislation seeks to improve hen welfare by banning the production and sale of battery hen eggs in the Territory and introducing complementary labelling requirements.

Assessing hen welfare is inherently difficult. Even experts in the field disagree on some important aspects, although it is generally accepted that, in the context of hen welfare, *all* commercial egg production systems suffer from some shortcomings. Drawing on expert studies that provide sufficient information to assess the rigour of their analytical framework and associated empirical work, the Commission has concluded that, on balance, the ban is likely to lead to some improvement in hen welfare, especially in the longer run as new techniques are developed to address some of the disadvantages of non-battery systems. This largely reflects the importance that animal scientists and other experts place on the capacity of hens to engage in certain behaviours that are not possible in battery cages — such as nesting, dust-bathing and perching.

There are, however, additional matters which the Commission must take into account for the purposes of a public benefit test. In particular, there is a need to consider whether there are other measures that could more efficiently improve hen welfare, and whether the benefits to the community stemming from improved hen welfare outweigh the costs. These matters are discussed below.

8.2 Alternative policy options

The Commission has considered the effectiveness of a number of alternative measures to the proposed ban. Some seek to constrain the types of eggs that can be supplied to the ACT, while others are intended to change the pattern of demand for eggs in the ACT. These options, which can be grouped under four broad headings, relate to:

- improving cage systems;

- improving management practices;
- taxing or subsidising battery egg production or consumption; and
- improving information to facilitate consumer choice.

Improving cage systems

There is some evidence to suggest that cages modified to meet some key behavioural needs of hens will improve welfare. For example, Temple (1994, p. 59) said that:

> ... modifications suggested to the standard cage systems ... offer a possible long-term solution. They seem to retain the advantages of the present cage systems while addressing all the perceived difficulties, except large-scale locomotion.

Modifications that could improve animal welfare include:

- the provision of perches in cages to improve bone strength and tail feathers (but these changes would not affect the level of bird stress, weight or immune system (Barnett, Glatz, Newman and Cronin, 1997a)); and
- solid sided cages to reduce the level of bird stress, improve feather cover and decrease bird pecking (Barnett, Glatz, Newman and Cronin, 1997b). (However, Glatz and Barnett (1996) report more dirty and broken eggs and a higher mortality rate (in a hot weather period), suggesting that further design modification may be needed.)

In these circumstances, one option would involve permitting the sale in the ACT of only those battery eggs produced in modified battery cage systems. This could involve a government inspection and certification process to identify producers using suitably modified cage systems. Like the proposed ban, the effective implementation of this option (and the following option) would require the ACT Government to gain an exemption from the Mutual Recognition Act to prevent eggs produced in unmodified battery cage systems by interstate suppliers being sold in the ACT.

This option could improve hen welfare. However, modifications which allow for all of the desired behavioural expressions, as well as a greater capacity for exercise and wing stretching, come at a cost which approaches that of non-battery alternatives. On the other hand, less extensive modifications — such as a facility for a perch — come at a relatively minor cost for producers (and consumers). Administrative costs associated with this option would be relatively modest. However, a major drawback is that it would not address the fundamental concern underlying the ACT legislative amendments — high stocking rates in battery cages.

Improving management practices

The Animal Welfare Act does not specifically cover the welfare of layer hens — it relates to all animals, including birds kept for commercial purposes or as domestic pets. Standards for management of layer hens are set out in the Code of Practice for Domestic Poultry. The Code, which is not legally enforceable, specifies certain actions that should be followed by egg producers (eg the prompt removal of dead and sick birds), but does not prohibit the keeping of hens in battery cages.

In these circumstances, another alternative — which could be coupled with the option outlined above — would be to modify the current Code of Practice. For example, it would be possible to specify more frequent surveillance of birds to facilitate earlier detection and retrieval of sick and dead birds. Subsequently, sales of battery eggs in the ACT could be permitted, but only by producers that comply with the higher animal husbandry and farm management standards specified in the modified Code.

While this alternative would produce some benefits, it also fails to deal with any of the key concerns about battery cages relating to the behavioural and physical freedom of hens.

Further modifications to the Code to exclude the supply of all battery hen eggs to the ACT could be contemplated but, given the Government's limited enforcement powers, this would appear to be less effective than a legislative (and legally enforceable) ban on battery eggs.

Taxation/subsidy options

An alternative to specifying changes to egg production systems and management practices would be for the ACT Government to modify the pattern of demand for eggs by changing the selling price of eggs produced by battery hens relative to eggs produced using other systems (eg increase the relative price of battery hen eggs to provide an incentive for higher consumption of other types of eggs). The effect of this on the pattern of demand would depend largely on the extent of the price change, as well as the responses of both producers and consumers. However, if it resulted in battery hen eggs becoming more expensive than other eggs sold in the ACT, this alternative could have similar effects on the sale of battery hen eggs as those resulting from the proposed ban.

In principle, this alternative could involve a tax or subsidy on either production or consumption of battery hen eggs. However, legal and practical constraints effectively eliminate tax options. For example, the ACT clearly does not have the

legal capacity to tax the production of battery eggs — or an input into egg production — that takes place in New South Wales. And, following a recent High Court decision that interpreted the meaning of the term 'excise duties' (the *Walter Hammond case*), it appears that, under the Constitution, the States and Territories do not have the power to levy a tax on the sale of a new (as opposed to second hand) commodity in their own jurisdiction. These powers essentially reside with the Commonwealth.

The subsidy option does not suffer from the same legal shortcomings. In principle, it would be feasible to subsidise ACT consumption of non-battery eggs to induce a switch in demand away from battery eggs and, thus, approximate the effects of the proposed ban on the sale of battery eggs. In practice, the subsidy might be best paid directly to ACT egg retailers.

Unlike the proposed ban, a subsidy would not necessarily restrict consumer choice — battery eggs would still be available provided there was sufficient demand. An attraction of this option is that the cost of the government action would be borne by all ACT taxpayers, not just by consumers of eggs. Given that the decision to introduce the ban reflects a community-wide objective determined by the ACT Legislative Assembly, this arguably represents a more equitable sharing of the cost burden. A subsidy, being a 'line item' in the Government budget, would also be more transparent — the amount paid by ACT taxpayers to improve hen welfare (ignoring additional administration costs and the like) would be reported annually, rather than being 'disguised' in higher average egg prices paid by consumers.

As with most subsidies, targeting of the subsidy would present some problems. More specifically, the subsidy would have to be paid to *all* consumers of non-battery eggs. As a result, consumers who normally buy barn-lay or free-range eggs would receive something akin to a windfall gain (ie they would be subsidised by the ACT community for doing what they would normally do — that is, buy non-battery eggs). This problem would escalate over time if, as most expect, the proportion of the market supplied by non-battery eggs, in the absence of any government intervention, increases of its own accord (see below).

One drawback of this option is uncertainty about both the size of the subsidy per egg required, and uncertainty about overall budgetary outlays. For example, to reduce demand for battery hen eggs to minimal levels, the subsidy might need to be of a magnitude sufficient to drop the price of non-battery eggs to a level a little below prevailing battery egg prices. On the other hand, it may well be that a substantial reduction in the current retail margin — reducing it from existing levels to (say) 20 cents per dozen — may produce a similar outcome (especially if comprehensive labelling requirements are in place). Some empirical work (to

estimate relevant price cross-elasticities) would be needed to shed some light on this issue.[1]

There could be some significant enforcement problems. In principle, the need to distinguish between battery hen and other eggs is a problem no different from the identification problem associated with implementing the proposed ban. However, with the subsidy option, the problem would be compounded because the number of egg sellers greatly outnumbers the number of egg producers. In addition, a system (and an associated audit process) would need to be established to receive and record sellers' sales volumes of non-battery eggs, and remit on a regular basis (eg monthly) the subsidy payment owing to each seller. This would, of course, also impose compliance costs on sellers.

Improving information to facilitate choice

In the ACT and Australia generally, there has been a significant increase in demand for non-battery eggs. Whereas a decade ago commercial egg supplies were nearly all sourced from hens housed in battery cage systems, eggs produced in non-cage systems (mainly barn-lay and free-range) have now gained a significant share of the market. In the ACT, barn-lay and free-range eggs are now estimated to represent about 14 per cent of the volume of retail market supplies.

In this context, the RSPCA stated:

> Since the launch of RSPCA [barn-lay] accredited eggs in Victoria and NSW over eighteen months ago, sales have increased by over 300%. Coles supermarkets, the main outlet for RSPCA accredited eggs in Victoria have stated that RSPCA-accredited eggs are the fastest growing sales item on their shelves. (sub. 46, p. 8)

These developments are consistent with trends in some other developed countries. For example, in Denmark, sales of non-battery eggs accounted for 25 per cent of the market in 1995, but are expected to reach 40 per cent in 1998 (Bijleveld (1995) cited in sub. 82).[2,3] A survey of major UK supermarket chains undertaken by Compassion in World Farming (CIWF) found that, in most chains, sales of non-

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[1] To estimate the total budget outlays, it would also need to be recognised that, as the average price of eggs would fall, aggregate demand for eggs in the ACT may rise slightly. Some allowance would also need to be made for increased purchases of non-battery eggs by consumers living in Queanbeyan (and other areas adjacent to the ACT) who would normally pay significantly higher prices for such eggs.

[2] For the EU as a whole, the proportion of the market supplied by non-battery eggs in 1995 was much lower — around 7 per cent. (sub. 82)

[3] The increase in non-battery eggs production in Denmark was facilitated by government financial incentives to assist producers to change production methods or, alternatively, exit the industry.

battery eggs as a proportion of total battery egg sales were in the range of 20 – 40 per cent. Three of the chains reported a higher proportion, with one (Marks & Spencer) reporting 100 per cent as a consequence of its decision not to stock battery eggs (sub. 51, appendix 2).

Many who participated in this current study believe that the share of the Australian egg market satisfied by non-battery eggs will continue to grow strongly. The growth is seen as reflecting not only changed consumer preferences, but also the scope for reductions in production costs (and prices) of non-battery eggs (mainly barn-lay) relative to the cost of producing battery eggs. These cost reductions are seen as resulting from improved management practices (particularly in barn systems which are still relatively new to Australia), from further scale economies and through the benefits of ongoing research and development (eg in breeding less aggressive hen varieties to overcome pecking and other forms of aggressive behaviour which can be a more significant problem in non-cage systems than in battery cage systems).

These trends form the basis for raising another policy option — allowing individual consumers, through their purchasing decisions, to determine the appropriate conditions in which layer hens should be kept. This does not imply the maintenance of the status quo. For this to be a meaningful option, consumers would have to have sufficient information available to enable them to make an informed choice. This would require government action to provide the necessary information. As Bennett (1995, p. 58) states:

> The first [option] is to use the market mechanism and allow people to make an informed choice about the products they consume. For this to work, consumers need to be well-informed about the animal welfare characteristics of the products they purchase and about alternative production practices and products. This would no doubt require government intervention in the supply of information.

The form of information supplied to consumers would need to go well beyond labelling — it would need to include detailed descriptions and analysis of the effects on hen welfare of each of the major egg production systems.

However, to be fully effective, this option would also require the labelling of all egg cartons to indicate the egg production method used. This would entail the ACT Government gaining the unanimous support of Heads of Australian governments to listing the labelling requirement as an exemption to the Mutual Recognition Act. If this were not forthcoming, battery eggs from interstate suppliers would not have to carry a label indicating how they were produced. However, to the extent that the Government information campaign could convey the message to consumers that "unlabelled eggs are battery eggs", the adverse effects of failing to obtain an exemption would be reduced.

During the six year period proposed before the introduction of the ban, an active information dissemination program would almost certainly accelerate the rate of market penetration of non-battery eggs. It is, of course, exceedingly difficult to estimate what the market share for non-battery eggs would be at the end of that period (ie around 2004), but a share in the order of 25–50 per cent is plausible.

The major advantage of this option is that consumers would retain the capacity to determine the type of egg (and the price) that best suits them. Hence, households which were unwilling consumers of battery egg alternatives would not be burdened with higher egg costs as they would be under the proposed ban. Adjustment costs would be substantially reduced. Administration and compliance costs would be relatively low, although there would be costs in assembling and disseminating the information needed to facilitate informed decision making by consumers.

The most obvious shortcoming of this alternative is that it only partially satisfies the ACT Legislative Assembly's goal — sales of battery eggs in the ACT would be significantly reduced, but they would still supply a considerable proportion of the ACT market. The effectiveness of this option would clearly be linked to the impact of the Government's information campaign to increase consumer awareness

8.3 Weighing up the ACT proposals

As noted above, there is little agreement about the effects on animal welfare of different egg production systems. However, based on the most authoritative studies in this field, the Commission considers it likely that a move away from battery cage systems towards alternative systems, such as barn-lay, would result in some improvement in hen welfare, especially in the longer term as further research reveals ways of reducing some of the disadvantages of alternative production systems (chapter 6). Neither the extent of the improvement in hen welfare as a result of the ban nor the benefits derived by the community are amenable to reliable quantitative assessment.

The net employment effect on the national economy is likely to be negligible (chapter 5). However, because alternative systems are more labour intensive than the battery cage systems they would replace, there could be a minor increase in employment in the industry. If Parkwood closes, (which, according to Bartter, would be the case if the ban is implemented), jobs in the ACT would be transferred interstate — predominantly to New South Wales.

The major economic costs would be reflected in higher ACT egg prices and adjustment costs.

The Commission estimates that retail prices for barn-lay eggs would be about 12 per cent higher than battery eggs in the medium term and between 4.5 and 7 per cent higher in the longer term (chapter 6). This increase would affect some commercial users (eg restaurants and fast food outlets) as well as households. In the case of households, the increase would be regressive — it would have a larger proportional impact on low income households.

The constant amount of money (the 'perpetuity') which the ACT community would need to save each year to pay for future price premiums on eggs is around $650 000.

Adjustment costs include the cost to society of the premature retirement of assets and costs associated with job losses at Parkwood (47 according to Bartter). Of these, the former is likely to be by far the more significant.

While some of Parkwood's assets are readily saleable (eg equipment such as tractors and generators), a substantial proportion of its assets are effectively immobile and would become redundant once the ban was in place. Based on an independent valuation supplied by Bartter, the economic loss to the national economy is likely to be no more than $4.4 million (chapter 5). The perpetuity needed to meet this is around $290 000 per annum.

There would also be some additional administration and enforcement costs. Some would be one-off establishment costs and some would be on-going costs. These costs are estimated to be minor relative to the consumer and adjustment costs (chapter 7). If the ACT Government were to adopt some of the complementary measures suggested by the Commission (chapter 4), some additional — albeit small —costs would be incurred.

The introduction of the labelling requirement would benefit some consumers by providing additional information upon which to base their choice of eggs. These benefits would be greatest in the six-year transitional period leading up to the ban. This is because most non-battery eggs already carry labelling indicating how they have been produced. Thus, once battery eggs are not available in the ACT, the need for a labelling requirement is not as great.

If the ACT does not apply for an exemption from the Mutual Recognition Act for the labelling requirement, the benefits from labelling would be reduced because, in the period prior to implementation of the ban, battery eggs from interstate would not have to comply with the legislation.

Egg suppliers to the Canberra market already extensively label their egg cartons. Consequently, even if they elect to sell eggs into other markets in different cartons to those sold in the ACT, any extra cost is likely to be small.

8.4 Summing up

As noted in Chapter 6, Government involvement in determining regulations and standards reflects, in part, disparities in the views of individuals. For example, some may think it is acceptable for a twelve year old child to hold down a full time job and drive a car on public roads. But these judgments violate community norms. In the absence of government involvement, the welfare of the community as a whole may be reduced. For these sorts of reasons, governments frequently act to protect community interests and prescribe minimum standards to apply to all members of the community.

Legislation put in place by all State and Territory governments to protect the welfare of animals may be viewed in this light. In the main, this legislation is generic in character.

The ACT amendments are supplementary to this generic legislation. They specifically address a subset of one class of animal — layer hens that are housed in battery cages.

Although animal welfare groups in many countries express concern about the implications of battery cage systems for animal welfare, only one country — Switzerland — has effectively banned egg production in battery cage systems. However, a number of other European countries — such as the Netherlands, Germany and Finland — have indicated a preference to ban battery cage systems. (The difficulties faced by individual EU countries in preventing imports of battery eggs (from other member countries) is one factor mitigating against a ban in these countries, as it is in individual jurisdictions within Australia's Federal system.)

There has been an active campaign in the ACT against battery eggs for some years. And it is evident that some in the community feel they are adversely affected by other people's consumption of battery eggs. While it is not clear how widespread this dissatisfaction is, the ACT Legislative Assembly clearly views its actions as being consistent with the interests of the broader ACT community.

The Commission's assessment, based on the views of experts in the area, that the ban will provide some improvement in hen welfare is, in itself, not sufficient to endorse its implementation. Two other issues need to be explored — whether the proposed ban is the *best* way to improve hen welfare and, if so, whether, in terms of the public benefits test required as a result of the ACT being a signatory to the National Competition Policy package, the ban would result in *net* public benefits.

Alternative measures

In terms of meeting the ACT Legislative Assembly's objectives, a shortcoming of most options canvassed in section 8.2 is that they don't cause producers to switch away from the use of battery cage systems, or do so only to a limited extent. This is clearly the case for two of the options: improving cage systems and improving management practices. To some extent, it is also true of the option permitting consumer choice. On the other hand, all of these options offer the prospect of avoiding most of the consumer and adjustment costs associated with the proposed ban.

Another option — subsidising ACT consumption of non-battery cage eggs — has some attractions. In some respects, it is superior to the proposed ban. For example, it is arguably more equitable because the bulk of the costs associated with the ban are borne by ACT taxpayers rather than by consumers of battery eggs. Being a budgetary item, the cost of a subsidy is also more transparent than the cost associated with a ban. However, there are some disadvantages. In particular, the efficient level of subsidy, both at implementation and in subsequent years, may be difficult to determine. And, under this option, administration, enforcement and compliance costs would be significantly higher than those associated with the proposed ban.

It is difficult to weigh up the relative merits of these policy options. However, the Commission considers that improving information flows and permitting individuals to choose the type of eggs they buy would be the next best alternative to the proposed ban. This option could reduce the number of hens housed in battery cage systems at a relatively low cost.

National Competition Policy

While the ACT Government can (as it has already done) pass the legislative amendments relating to battery eggs, it needs to conform with two national agreements to which it is a signatory if the legislative amendments are to be effective in achieving their stated goals. The two inter-governmental agreements bind jurisdictions to a national approach to mutual recognition and competition policy.

The ACT needs to seek an exemption to the Mutual Recognition Act for the ban because, without it, it would not be able to prevent the sale in the ACT of battery eggs imported from other jurisdictions where it is legal to produce and sell battery eggs (all other parts of Australia). However, before applying for the exemption, the ACT also needs to comply with the Competition Principles Agreement, which

obliges it to subject new legislation that restricts competition (or amendments to existing legislation) to a public benefit test.

Public benefits associated with the ban on battery eggs

The analysis summarised above suggests that the cost associated with the ban would be equivalent to an annual sum in perpetuity in the order of $940 000. This cost would largely be borne by ACT residents.

As noted above, the benefits stemming from improved hen welfare cannot be reliably quantified by the Commission. This, in part, reflects the fact that the proposed ban raises complex ethical as well as economic issues.

The benefits from improved hen welfare will accrue not only to ACT residents, but also to other Australians who derive some satisfaction from a reduction in the number of hens housed in battery cages. New South Wales egg suppliers could also benefit through the creation of new market opportunities.

With the costs of the ban largely confined to the ACT, any decision made by the ACT Government on this issue should not make the rest of Australia any worse off, and could make it better off. The fundamental question is, therefore, whether the benefits from banning the production and sale of eggs produced by hens housed in battery cages is greater than an annual perpetuity of around $940 000. If the ACT Government judges this to be the case, the Commission considers that, in terms of the Competition Principles Agreement, the benefits associated with the restriction to competition resulting from the legislative amendment would outweigh the costs.

In considering this issue, the Commission suggests that the ACT Government also assess the merits of pursuing its layer hen welfare objectives by adopting the option outlined above involving the provision of information to facilitate informed consumer choice. The Commission cannot make a direct comparison of the net benefits of this option and the proposed ban, mainly because it is not possible to meaningfully assess the benefits that would result from the improvements in hen welfare under either alternative. These are judgements that will need to be made by the ACT Government. However, while this option would be less effective than a ban in reducing the use of battery cage systems, it would avoid many of the costs associated with a ban.

Public benefits associated with the labelling requirements

The cost of labelling required by the ACT legislative amendments is minor — egg cartons already carry extensive printed information. Provided the descriptions of

egg production systems are accurate, and the labelling requirement is properly enforced, the additional information should benefit some consumers. However, if the ACT Government does not apply for an exemption to the MRA, eggs from interstate suppliers will not have to conform with the labelling requirement. If the major ACT producer — Parkwood — closes in response to the ban, this raises the possibility that virtually no eggs subsequently sold in the ACT would need to comply. Notwithstanding this possibility, the Commission considers that the benefits of the legislative amendments relating to labelling (especially in the six year transitional period) outweigh the costs.

To make the labelling requirements more effective, the Commission considers that the ACT Government should seek an exemption to the Mutual Recognition Act.

Implications for other animal welfare concerns

This assessment relates specifically to the welfare of layer hens and to the particular circumstances of the ACT regional economy (eg the present sourcing of eggs to meet local demand is one relevant factor). As a result, the findings do not provide a basis for inferring what might be the outcome of a public benefit test of a similar ban proposed by another jurisdiction, or of a public benefit test that assesses the effects of a ban on any other intensive livestock activity. Similar considerations apply to the ACT egg labelling requirement.

A Ministerial correspondence

This appendix comprises:

- a letter from the Treasurer to the Chairman of the Productivity Commission agreeing to the ACT Government's request that the Commission undertake the study;
- a copy of the letter to the Treasurer from the ACT Chief Minister requesting the study be undertaken; and
- the terms of reference for the study developed by the ACT Government.

TREASURER

PARLIAMENT HOUSE
CANBERRA ACT 2600

29 July 1998

Mr Gary Banks
Chairman
Productivity Commission
PO Box 80
BELCONNEN ACT 2616

Dear Mr Banks

I have received a request (copy attached) from the Chief Minister of the Australian Capital Territory for the Productivity Commission to undertake Public Benefit Tests on changes to the permanent exemptions listed in the Commonwealth's Mutual Recognition Act 1992 and associated labelling provisions in the ACT's Food (Amendment) Act 1997. A guiding principle of the Competition Principles Agreement is that legislation which restricts competition should be subject to a Public Benefit Test.

I have agreed to the Chief Minister's proposal and request that the Commission complete its report within ten weeks. I have asked the Chief Minister to release the report soon thereafter. I note the Chief Minister's agreement for the Commission to be reimbursed for out-of-pocket expenses.

I have copied this letter to the Chief Minister.

Yours sincerely

PETER COSTELLO

Chief Minister
Treasurer

Member for Molonglo
Australian Capital Territory

The Hon Peter Costello MP
Treasurer
Parliament House
CANBERRA ACT 2600

Dear Treasurer

I am writing to seek your agreement to the Productivity Commission undertaking Public Benefit Tests on changes to the permanent exemptions listed in the Commonwealth's *Mutual Recognition Act 1992* and associated labelling provisions in the *ACT's Food (Amendment) Act 1997*.

The need to undertake these tests has emerged as a result of the passage in the Legislative Assembly on 19 September 1997 of the *Animal Welfare (Amendment) Act 1997* and the *Food (Amendment) Act 1997*. The combined effect of this legislation when implemented will be to prohibit in the ACT the sale and production of eggs using battery cage systems.

To give egg producers time to adjust to these changes, the prohibition on the use of battery cage systems will only come into force six years after the date on which Section 24A (1) of the *Food (Amendment) Act 1997* is added to the permanent exemptions listed at Schedule 2 of the Commonwealth's *Mutual Recognition Act 1992*.

As you are aware, it is a requirement of the Competition Principles Agreement that any new legislation or amendments to existing legislation that restrict competition be subject to a Public Benefit Test. One of the effects of the legislation would be to restrict competition — egg sales in the ACT would be restricted to those local and interstate producers who do not use battery cage systems for egg production.

In addition to the mutual recognition issues, Section 24B of the *Food (Amendment) Act 1997* also requires that all egg cartons displayed or sold in the ACT be labelled with the conditions under which the hens produced the eggs. In order to implement the labelling provision, a regulation will have to be made that allows for the prescribing of expressions, and prescribing expressions to be used on egg cartons. This regulation will also have to be reviewed against the requirements of the Competition Principles Agreement.

The major reason for seeking the Productivity Commission's involvement is the potential national significance. This has two dimensions. First, that the regulatory issues concerning eggs produced by battery hens that have been raised in the ACT could well be an issue for other jurisdictions. More importantly, the issues could be relevant to other significant Australian activities (eg certain pig and cattle raising businesses). Consequently, the issues could well have important national implications. It would therefore be appropriate for the Commission to undertake the requested Public Benefits Tests on behalf of the ACT Government.

Finally, as this will be a relatively short, low cost exercise the ACT Government will meet any 'out-of-pocket' expenses incurred by the Commission.

I look forward to receiving your reply on this matter.

Yours sincerely

Kate Carnell MLA
Chief Minister

11 MAY 1998

Terms of Reference

The ACT Government has requested the Productivity Commission to carry out two Public Benefit Tests — one on the proposed amendment to the Commonwealth's *Mutual Recognition Act 1992* and a second one on the labelling requirements of the ACT *Food (Amendment) Act 1997*. In order to provide an objective framework for the Public Benefit Tests, the following Terms of Reference have been developed for both amendments so that costs and benefits to the community of the amendments can be assessed.

1. In undertaking the Public Benefit Tests on behalf of the ACT Government the Productivity Commission will take into account clause 5(1) of the Competition Principles Agreement (CPA). The guiding principle of clause 5(1) is that legislation (including Acts, enactments, Ordinances or regulations) should not restrict competition unless it can be demonstrated that:

   (a) the benefits of the restriction to the community as a whole outweigh the costs; and

   (b) the objectives of the legislation can only be achieved by restricting competition.

   All aspects of the current regulatory regime will be considered in the context of their impact on the community, the industry and the economy. Subclause 1(3) of the CPA provides guidance on matters that may be taken into account when determining the public benefit of particular objectives:

   "Without limiting the matters that may be taken into account, where this Agreement calls:

   (a) for the benefits of a particular policy or course of action to be balanced against the costs of the policy or course of action; or

   (b) for the merits or appropriateness of a particular policy or course of action to be determined; or

   (c) for an assessment of the most effective means of achieving a policy objective;

the following matters shall, where relevant, be taken into account:

(d) government legislation and policies relating to ecologically sustainable development;

(e) social welfare and equity considerations, including community service obligations;

(f) government legislation and policies relating to matters such as occupational health and industrial relations and access and equity;

(g) economic and regional development, including employment and investment growth;

(h) the interests of consumers generally or a class of consumers;

(I) the competitiveness of Australian businesses; and

(j) the efficient allocation of resources."

2. Without limiting the above factors the Productivity Commission shall take into account:

   (a) the economic benefits and costs of different egg production systems;

   (b) the social benefits and costs of different egg production systems; and

   (c) the environmental benefits and costs of different egg production systems.

3. In taking into account these benefits and costs, and in recognition of the Australia-wide implications of amendments to the Mutual Recognition Act 1992, the Productivity Commission shall not be limited to benefits and costs arising within the ACT only.

   In weighing up the costs and benefits the Productivity Commission will take into account the fact that the legislation would not come into effect until six years after the Commonwealth's Mutual Recognition Act 1992 has been amended. The weighing up of costs and benefits will be undertaken on both qualitative and quantitative grounds.

B Public participation

Shortly after receiving the Treasurer's request to undertake the study, an advertisement was placed in the Canberra Times inviting interested parties to register their interest with the Commission. Those organisations and individuals that contacted the Commission in response to the advertisement, along with other parties identified by the Commission as likely to have an interest in the inquiry (eg egg suppliers to the ACT market, animal welfare groups, government organisations and researchers), were forwarded a circular inviting them to prepare a written submission to the study by 9 September 1998.

On 15 September 1998, copies of major submissions (excluding confidential material) were distributed to all organisations that had prepared submissions for the study, along with an invitation to comment on both factual matters and the views expressed in those submissions.

In total, 104 submissions (including responses to other parties' submissions) were received. Of these, around 70 were letters from individuals expressing support for the ACT legislative amendments. The submissions received are listed in table B.1.

The Commission also held informal discussions with organisations and individuals to help understand the major issues. Some of those discussions involved inspections of the three major egg production systems used in Australia. Some discussions used teleconference facilities. Those organisations and individuals with whom discussions were held are listed in table B.2.

Research team

This report was researched and written by Ralph Lattimore, Alan Madge and Garth Pitkethly. Geraldine Martisius provided administrative support.

Table B.1 Submissions received

Participant	*Submission Number(s)*
ACT Government	74
Action Magazine	52
Alexander, Maria	60
Animal Liberation (ACT)	33
Animal Liberation (NSW)	50
Animal Liberation (QLD)	81
Animal Liberation (SA)	54
Animal Liberation (VIC)	85
Animal Rights Advocates	53
Animal Rights Education	98
Animals Australia	83/97
Australian Catholic Study Circle for Animal Welfare	87
Australian Egg Industry Association	76/102
Ball, G T	56
Ball, Iris	55
Bartter Enterprises	30/100
Brown, Juliet	58
Caldon, James	36
Carroll, Desmond D	92
Clissold, Matthew	82
Compassion in World Farming	42
Conservation Council of the South-East Region & Canberra	62
Cook, Betty	8
Cowley, Judith	77
Cresswell, Ian	24
Curtin, John F	63
Davey, Cheryl	64
Department of Treasury & Finance (TAS)	7
Dept of Primary Industry & Fisheries (NT)	9
Downing, E	2
Elwis, Terry	14
Estelle, Naomi	61
Fairleigh, Jean	11
Graham, Phyllis	21
Greig, B	10
Gundry, Nerida E	66
Hamston, Susan	41
Hawke, Iris	19

Participant	*Submission Number(s)*
Herlihy, Astrid	45
Horkan, B E	80
Horne, Barry & Elaine	90
Humane Society International	51
Humane Society of WA	48
Hunter Animal Watch	35
Indecipherable name	67
Indecipherable name	75
Jedryk, John & Suzanne	28
Jones, Ann	6
Jordan, Bill	15/93
Kirby, Robyn	104
Kouwenberg, Saskia	17
Langford, Mervyn	89
Lewin, Jenny & Terry	69
Lowery, Kirsten	47
Ludbrook, B	25
Lynga, Gosta & Pauline	26
Martin, Gertrude	95
Martin, Heather	37
Martin, J	70
Mason, Joan	29
Mayne, Peggy	31
McEwen, Paulene	65
Meischke, H R C	103
Mendel, Pam	88
Montague, Lilian	22
Montague, Ronald H	20
Moore, Peta	3
Moulla, J	68
Myers, Anneke	49
National Registration Authority for Agricultural & Veterinary Chemicals	34
Natural Resources & Environment	73
NSW Farmers' Association	78/99
Ogilvie, David	18
Orr, Kriotic; Bradley, A; Lobsey, Megan; Griffiths, A; and others	39
Parkes, Olga	44
Pearce, Rosemary	91
Plier-Malone, J	96

Pope, Tony	32

Participant	*Submission Number(s)*
Radord, Marian	43
Redman, J C	27
Rees, A	84
RSPCA Australia	46
Sanders, Dick	16
Sandoz, Jean	86
Seggie, Joan	40
Selmes, Carmel	79
Selmes, Christine	94
Shannon, Marcia	59
Smith, Eleanor	13
Soloman, Maree	71
Sony Art Dept – McIntyre, Erica	38
Starling, D I	4
Terry, Ed	23
Tucker MLA, Kerrie	57
von Bertouch, Anne	5
Walsh, Lucy	12
White, Kevin	1
Wilks, Ann Verona	72
Williams, Rhian	101

Table B.2 Visits and discussions

Name	*Organisation*
Professor David Adams	Principal Research Scientist, Bureau of Resource Sciences
Mr Peter Barber	State Director, RSPCA Victoria
Dr John Barnett	Victorian Institute of Animal Science
Mr Bruce Bevan	Executive Director, Australian Supermarket Institute Limited
Ms Jac Grangien	Country Eggs
Mr Geoff Keogh	ACT Chief Minister's Department
Mr Ian Livingstone	Pace Farms
Mr Beat Loeliger	Counsellor, Embassy of Switzerland
Mr Gordon McCallister	Office of Ms Kerrie Tucker MLA
Mr Hugh McMaster	Executive Director, Australian Egg Industry Association
Mr David Mitchell	Assistant Director, Animal Welfare Section, Commonwealth Department of Primary Industries and Energy
Dr Liam Morrisroe	Geneticist and Veterinary Manager, Bartter Enterprises
Ms Glenys Oogjes	Director, Animals Australia
Mr Frank Pace	Managing Director, Pace Farms
Mr Greg Parkinson	Victorian Department of Agriculture
Mr Petar Pirovic	F Pirovic and Sons
Ms Leanne Power	ACT Chief Minister's Department
Ms Frankie Seymour	President, Animal Liberation (ACT)
Professor Peter Singer	Animals Australia and Deputy Director, Centre for Human Bioethics
Ms Kerrie Tucker MLA	ACT Greens
Mr Brian Wiltshire	Bartter Enterprises
Dr Hugh Wirth	President, RSPCA Australia
Mr Charles Wright	RSPCA NSW

C What other countries do

This appendix briefly outlines some of the initiatives that have been introduced in other countries either to ameliorate the animal welfare effects of battery cage systems or to outlaw them altogether. Most attention is paid to Switzerland, as this is the only country to date to have effectively outlawed battery cage production.[1]

The European Union

As Larkin et al (1997, p. 56) note, in Europe there is generally more concern with hen welfare than, for example, in the US. Nevertheless, overall some 93 per cent of Europe's 270 million layer hens continue to be kept in cages (World Animal Net: Battery Hens Campaign, Legislation, p. 3).

In the EU, all egg production — barn-lay, aviary and free-range, as well as battery cage — is highly regulated. For example, general welfare regulations cover protection of animals during transport, husbandry practices, animal care prior to slaughter, design and construction of buildings, and feed and water supply. In addition, there are specific provisions for battery cages, other intensive egg production systems and for free-range production.

Concern about the welfare of battery caged hens has been an element in EU agri-politics for some time. Demand for change has taken two overlapping avenues: the banning of battery cages per se and proposals for making battery caged production more acceptable (eg by increasing the minimum area per bird and installing perches and nesting boxes). A proposed new EU directive, to apply to newly built, or rebuilt systems, from 1 January 1999, and to all systems from 1 January 2009, proposes to increase the minimum area per hen from 450 square centimetres to 800 square centimetres (World Animal Net: Battery Hens Campaign, Legislation, p. 6 and Dunn 1997, p. 32).

On an individual European country basis, Larkin et al (1997, p. 56) note that hen welfare considerations are not prominent in French advertising (suggesting a low

[1] Objections to battery cages appear strongest in Europe, especially the northern member states of the EU, and to be lowest in Asia. This may in part be income related — the impact of higher egg prices is clearly less in higher income countries.

level of concern), but are more prominent in the UK and Scandinavian countries. Compassion in World Farming (sub. 42, p. 7) notes that the Netherlands Minister of Agriculture is pressing for a EU-wide ban on the battery cage system, and that there is evidence of concerns in Austria about the welfare implication of battery cages. Denmark appears to have unilaterally introduced a minimum space allowance for hens of 600 square centimetres per bird (World Animal Net: Battery Hens Campaign, p. 8).

However, as noted by Animals Australia (sub. 97, p. 5), EU member states cannot stop the import of battery eggs on a unilateral basis. Hence, a number of countries — Germany, the UK, Finland and Holland — appear to have put aside their preference to phase out battery cages until there is EU agreement. In Animals Australia's view, there is a clear trend in sentiment within the European community away from battery cages, led by the EU's northern member states.

Sweden

In 1988, Sweden passed the Animal Welfare Ordinance which banned the keeping of layer hens in battery cages from 1 January 1999. It has also banned beak trimming (World Animal Net: Battery Hens Campaign, Legislation, p. 8). However, the NSW Farmers' Association notes that the ban on caged hens has been extended until 2004 as the criteria set for alternative systems to caged production cannot be met. The Association considers the major reason for this is the ban on beak trimming, which has led to alternative systems, at least for the present, having unacceptable levels of feather pecking and cannibalism. On the other hand, Animals Australia stated that the Swedish implementation has been postponed primarily because:

- the development of alternative systems is not sufficiently advanced to accommodate the Swedish laying flock; and
- entry into the EU makes it more difficult for Sweden to act unilaterally.

However, according to Animals Australia (sub. 97, pp. 4–5), there is a steady movement towards non-caged alternative production systems in Sweden.

Switzerland

The Swiss Animal Protection Act, which came into force in 1981 following a referendum in 1978, effectively outlawed battery egg production in Switzerland. The ban was achieved by prescribing certain housing conditions for hens:

- sheltered, darkened nest boxes;
- perches or slatted grids for all hens; and
- a minimum area of 800 square centimetres per bird on mesh floors (Swiss Society for the Protection of Animals STS (SSPA) 1994, p. 3).

Swiss poultry farmers had a 10 year transition period to bring their hen housing in line with the new regulations.

The Act also established centres to research, test and evaluate alternative hen housing systems and their equipment (SSPA 1994, p. 3). According to SSPA, aviary systems are now clearly established as the most commercially viable of these alternatives.

How well has the Swiss change worked? Comment on the Swiss Aviary system, perhaps not surprisingly, tends to reflect the perspective of the reviewer. Animal welfare groups find much to recommend in the Swiss change, while producer groups find much to criticise.

The Working Group on the Welfare Aspects of Layer Hen Housing (1994, p. 133) quotes Morgenstern and Lobsiger (1993) to the effect that following the change:

- compared to caged systems, there was a return to non-specialised management, and an increase in disease, reflected in increased mortality of 0.2 per cent per month;
- farm sizes fell and the industry became more fragmented, making it more difficult to organise disease control and treatment on a large scale;
- about 50 per cent of poultry products were imported; and
- Swiss egg production costs rose to about three times the price of imported (battery cage) eggs.

In a similar vein, the submission from Bartter Enterprises notes:

> Cages have been banned in Switzerland. This has resulted in 70 per cent of all eggs eaten in Switzerland being imported from Germany and Holland where caged egg production is allowed. (sub. 30, p. 7.)

However, Animals Australia (sub. 97, p. 4) contends that, because of specific legislative requirements, Switzerland has always imported around half of its shell eggs and egg products. According to this organisation, imports of shell eggs fell in Switzerland between 1984 and 1992 and, in 1992, Switzerland produced 65 per cent of its shell eggs.

Animals Australia's comments are reinforced by the SSPA which notes that the Swiss Order on the Egg Market and the Supply (Section 2, Laws and Regulations) of eggs prescribes that domestic production of shell eggs shall not exceed 65 per cent of average consumption in the last two years. Moreover, the organisation argues that, while imports of egg products for use in pasta and large scale bakery products have increased considerably, imports of shell eggs have fallen from 399 million units to 342 million units. In SSPA's view, this shows that Swiss consumers are prepared to support home production — and presumably its production system — despite the price differential in favour of the imported product (SSPA 1994, p.4). According to the SSPA (1994, p. 27), the massive increase in hen health problems, feared by some to result from the ban, has not materialised. Birds are able to perform a variety of normal behaviours (such as nesting and litter pecking), although there have also been small increases in mortality and disease rates (SSPA 1994, pp. 28–31).

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D Costs to consumers

D.1 Framework

As noted in chapter 5, the long run supply curve for eggs can be assumed to be close to flat.[1] In this case, the impact of the ban is to shift the supply schedule (S) up, so that the costs of production (for any desired quantity) are higher. The economic costs of the ban — borne fully by consumers in the long run — are largely described by the two areas **A** and **B** under the demand curve in figure D.1. **A** represents the cost premium that former battery egg consumers bear at the new purchase quantities after the ban. **B** represents the loss to consumers arising from forgone consumption of eggs. Since consumers must pay more for future egg consumption from the date of the ban, it is important to capture the dynamic effects of the ban — including population growth, changing patterns of egg consumption and shifts in technology. This appendix describes the detailed methodology for estimating the values of **A** and **B** over time, as well as some other possible sources of costs for intermediate consumers.

The analysis is in 1998–99 current prices, so that inflation can be ignored. Free-range eggs are also largely ignored because it is likely that barn-lay, rather than free-range eggs, will replace battery cage eggs.[2]

A critical aspect to measuring the economic costs is the extent of the upward shift in the supply schedule. S_0 is the supply schedule under the counterfactual of no ban, while S_1 is the supply schedule if the ban proceeds. Next, the characteristics of these supply schedules are considered.

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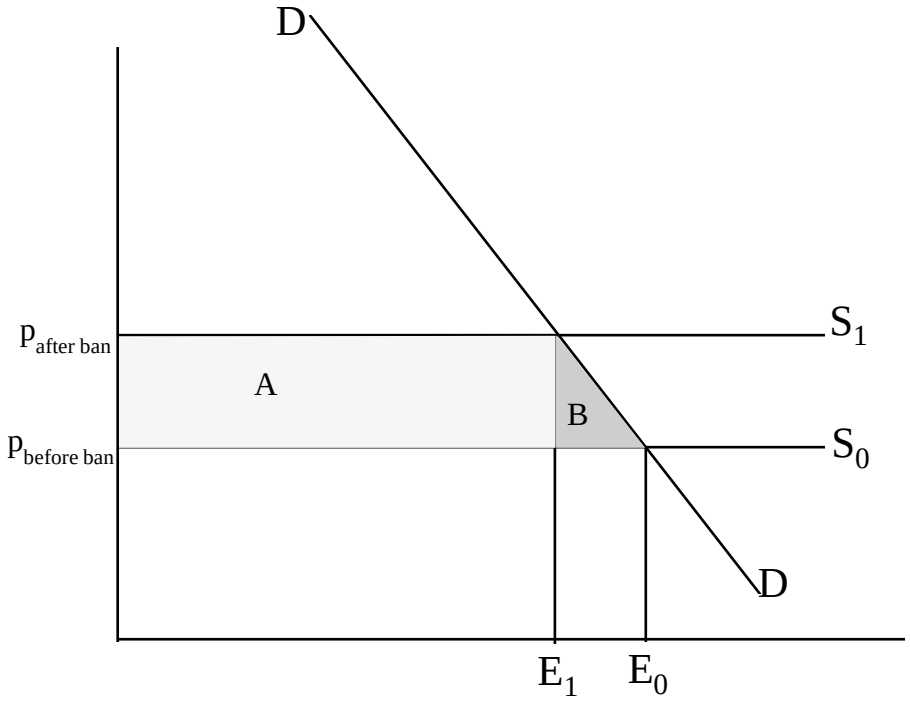
1 For a models in a similar spirit see Wilcox (1989), Sandiford (1985) and Hafi et al (1994).

2 The outcomes are also modelled as if the only policy change is a ban on battery eggs, and ignoring the proposed interim change to egg labelling. If egg labelling is successful at shifting consumption significantly away from battery eggs, then the cost of the ban is much less than is projected here.

D.2 Production costs

As noted in chapter 5, data on production costs were obtained for different egg types from a number of industry and government sources. The full economic costs of producing a dozen 59 gram battery and barn-lay eggs are about $1.25 and $1.70 respectively.[3] Full economic costs include depreciation and the return on capital required by the poultry farmers. If farmers do not at least get farm-gate prices which cover these costs, then they will not enter the egg market, although existing incumbents may stay temporarily given sunk capital.

Figure D.1 **Costs for consumers from the ban**[a]



a If the supply curve is less elastic (say as in Hafi et al 1994, p. 63), then there are reduced losses to consumers, but bigger (and permanent) losses to producers. However, calculations suggest that, for reasonable supply elasticities, the overall cost measures are similar.

If there is a ban on battery egg production in the ACT, then barn-lay production will increase, and the appropriate measure of production costs for these eggs should incorporate depreciation and a return to capital (since *ex ante* these assets could be used in other industries and, thus, have a real opportunity cost). However, under the

[3] Free-range egg production costs are around $2.15 (or about 25 per cent more expensive than barn-lay), while their retail prices are around $3.85 (or about 4 per cent more expensive). Because of these cost and price relativities, it seems reasonable to suppose most production and demand for battery eggs will be directed to barn-lay rather than free-range eggs if the ban is implemented.

counterfactual of no ban, there would be very little entry into battery cage production because of current excess supply. This implies that the appropriate measure of resource costs for battery egg production should exclude sunk costs, such as physical capital already allocated to battery cage production. At the moment, farm-gate prices for these eggs are about $1.10 to $1.15, and this should provide a better measure of the short run battery egg production costs than $1.25. If no account is taken of these short run supply features of egg production, there would be a risk of underestimating the costs of the ban. Over time, new investments would need to be made in battery egg production (under the counterfactual) and, all other things being equal, the resource costs would rise to $1.25.

Over time, there are other influences on costs which need to be accounted for. All egg production modes are likely to benefit from further cost reductions, with new hen breeds, feedstock, better disease controls and learning. In battery cages, the returns to new technology and learning are likely to be smaller than in alternatives, such as barn-lay (given the vintage of the technology). In contrast, there appears to be scope for more significant long run reductions in barn-lay production costs, given the novelty of this mode of production in Australia, and the fact that the type of barn-lay system put in place after the ban might not conform with the current RSPCA-approved barn system (for example, stocking rates could be higher). As observed in chapter 5, in Europe, the production costs of barns, aviaries and percheries are closer to the cost of battery cage production than is the case currently in Australia.

Accordingly, it is assumed that, over the long run, there are two sources of cost-reductions. One shifts all costs down (by 10 per cent in the long run), the other shifts down the cost of barn-lay relative to battery cages (to a final margin of 15 per cent).

These, with other aspects of production, are characterised as follows:

$C_{BC,0}$ = $1.15 (the short run production costs for battery cages at time 0 — which is 1998–99).

$C_{BCNE,0}$ = $1.25 (the production costs for battery cages of a new entrant at time 0).

$C_{BL,0}$ = $1.70 (production costs for barn-lay eggs at time 0).

$\rho = 0.1$ (the rate of long run cost diminution across all production modes).

$\zeta_t = 1/([1/\phi_1]+[1/\theta_1-1/\phi_1]*0.98^t)$ which is a logistic function describing how cost reductions for *all* production modes are achieved over time, with the long run described by $\phi_1 = (1-\rho)$ and the short-run by $\theta_1 = 1.0$.

$C_{BCLR,t} = \zeta_t * C_{BCNE,0}$ is the long run production cost for battery eggs, which reduces over time as technology improves.

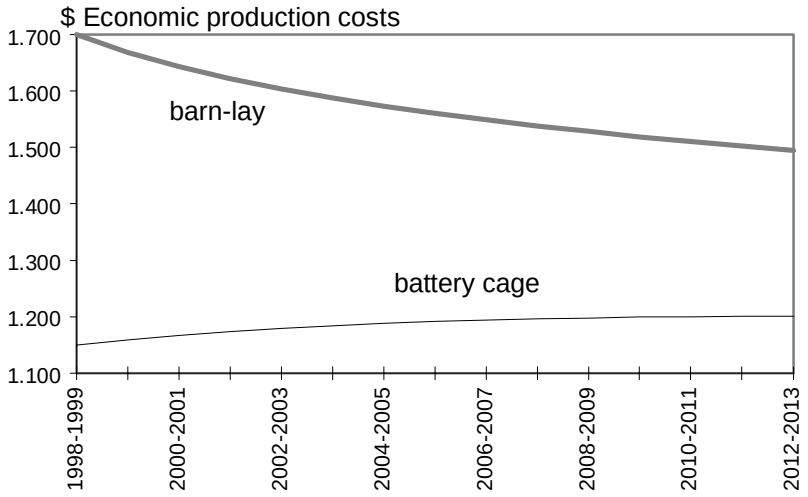
$C_{BC,t} = 1/([1/C_{BCLR,t}]+[1/C_{BC,0}-1/ C_{BCLR,t}]*0.9^t)$ which represents the resource costs for production of battery eggs over time (starting at the short run, $C_{BC,0}$, and approaching $C_{BCLR,t}$ in the long run).

$GAP_{BL,t} = 1/([1/\phi_2]+[1/\theta_2-1/\phi_2]*0.96^t)$ which is a logistic function describing how the cost gap between barn-lay and battery cage production moves over time, with the long run described by $\phi_2 = 0.15$ (ie a 15 per cent long run cost difference) and the short-run by $\theta_2 = C_{BL,0}/C_{BC,0} - 1$.

$C_{BL,t} = (1+ GAP_{BL,t}) * C_{BC,t}$ which represents the resource costs for production of barn-lay eggs over time.

Figure D.2 shows the projected path of the two critical variables, farm production costs per carton (with zero inflation) for the two modes (ie $C_{BC,t}$ and $C_{BL,t}$) over a 15 year period.

Figure D.2 **Projected farm production costs, barn-lay and battery cages**
$ per carton



Data source: Commission calculations.

D.3 Retail prices

Production cost differences between the different systems are the key to costs borne by consumers, but information about retail prices is needed in order to calculate how demand may shift, and how different types of consumers lose and gain.

As noted in chapter 6, it is assumed that the absolute retail margin currently applying to battery eggs is an appropriate measure of the margin that would exist on barn-lay eggs in the ACT were they to become the dominant source of eggs.[4] Retail prices are calculated by adding the appropriate margin to the production costs. The 'retail' margin includes margins applied by both wholesalers and retailers.

Accordingly, retail prices are defined as follows:

$R_{BC,0}$ = \$2.88 for a 700 grams carton of battery cage eggs for 1998–99.

$R_{BL,0}$ = \$3.69 for a 700 grams carton of barn-lay eggs for 1998–99.

BAN_t = 1 if t >7, and otherwise t = 0 (ie this variable equals zero prior to the ban, and 1 after).

$R_{BCNB,t} = C_{BC,t} + R_{BC,0} - C_{BC,0}$ which is the projected retail price of battery cage eggs if there is *no ban*.

$R_{BLNB,t} = C_{BL,t} + R_{BL,0} - C_{BL,0}$ which is the projected retail price of barn-lay eggs if there is *no ban*.

$R_{BL,t} = C_{BL,t} + BAN_t\ \lambda(R_{BC,0} - C_{BC,0}) + (1-BAN_t)*(R_{BL,0} - C_{BL,0})$ which is the projected retail price of barn-lay eggs if the *ban comes into place*. λ represents a scaling variable which takes account of the extent to which barn-lay eggs sold in higher volumes benefit from the same margin as currently applying to battery eggs. If $\lambda = 1$ (the preferred estimate), then barn-lay eggs obtain the same absolute margin.

D.4 Market shares

Market shares of the various egg types are unlikely to remain fixed over time. The ACT egg market has two relevant dimensions for this analysis:

4 Sandiford (1985, pp. 110–111) finds strong econometric evidence that egg price margins can be characterised this way in the UK.

- the type of use. This includes: direct consumption by households; consumption in cafes and restaurants of food incorporating eggs (for example, omelettes); and consumption of other products incorporating eggs (for example, confectionary, shampoo and baked goods). It is assumed that direct household consumption will decline somewhat, while indirect consumption will slightly increase.
- the type of egg (free-range, battery cage or barn-lay). As people's income rises, they tend to place higher value on perceived animal welfare, and that, with projected cost decreases, is likely to continue the present market trend towards higher consumption of alternatives to battery eggs — even if no ban proceeds.

By use

The analysis starts by defining how the market share for eggs *by use* evolves over time. As is customary in models of consumer goods, the long run market shares are assumed to be asymptotic to a saturation point.

$MKTSH_{H,t} = 1/([1/\phi_3]+[1/\theta_3-1/\phi_3]*0.98^t)$ is the share of ACT eggs consumed *directly* by households (in the absence of a ban), with the long run described by $\phi_3 = 0.75$ (ie a 75 per cent market share) and the short-run by $\theta_3 = 0.80$ (see chapter 6).

The remaining market segment is split between catering and other products:

$SH_{C,t} = 1/([1/\phi_4]+[1/\theta_4-1/\phi_4]*0.98^t)$ is the share of ACT eggs consumed indirectly by households from cafes and restaurants (in the absence of a ban), with the long run described by $\phi_4 = 0.14/(1 - \phi_3)$ (ie a 14 per cent share of the *whole* ACT egg market) and the short-run by $\theta_4 = 0.11/(1 - \theta_3)$ (implying an 11 per cent share of the whole market — see chapter 6).

$SH_{I,t} = 1- SH_{C,t}$ where $SH_{I,t}$ is the share of industry in the indirect eggs market.

The shares of the *whole* ACT egg market for these uses are defined as:

$MKTSH_{C,t} = SH_{C,t}(1 - MKTSH_{H,t})$

$MKTSH_{I,t} = SH_{I,t}(1 - MKTSH_{H,t})$

where $MKTSH_{C,t}$ and $MKTSH_{I,t}$ are the shares of catering and other industry respectively in the entire ACT eggs market.

By type of egg consumed directly by households

The next step involves calculating the share of the ACT *direct household* market accounted for by free-range eggs versus other types of eggs:

$SH_{FR,t} = 1/([1/\phi_5]+[1/\theta_5-1/\phi_5]*0.98^t)$ is the ACT retail market share of free-range eggs (in the absence of a ban), with the long run described by $\phi_5 = 0.15$ (ie a 15 per cent market share) and the short-run by $\theta_5 = 0.095$ (The NSW Farmers' Association, sub. 78).

The remaining market $(1- SH_{FR,t})$ is split between battery cage eggs and barn-lay. $PT_{BC,t} = 1/([1/\phi_6]+[1/\theta_6-1/\phi_6]*0.98^t)$ is the share of battery cage eggs in this market segment (in the absence of a ban), with $\phi_6 = 0.65/(1-\phi_5)$ (implying a 65 per cent share of the ACT *direct household* egg market) and the short-run by $\theta_6 = 0.862/(1-\theta_5)$ (The NSW Farmers' Association, sub. 78).

Clearly, the market share of this segment of demand held by barn-lay is $PT_{BL,t} =1 - PT_{BC,t}$. This in turn implies that the shares of the *whole* ACT egg market for these types of eggs are:

$MKTSH_{FR,t} = SH_{FR,t} * MKTSH_{H,t}$

$MKTSH_{BC,t} = PT_{BC,t} * (1 - SH_{FR,t}) MKTSH_{H,t}$

$MKTSH_{BL,t} = (1 - PT_{BC,t}) * (1 - SH_{FR,t}) MKTSH_{H,t}$

where $MKTSH_{FR,t}$, $MKTSH_{BC,t}$ and $MKTSH_{BL,t}$ are the respective shares of free-range, battery cage and barn-lay eggs consumed directly by households in the entire ACT eggs market.

D.5 Egg consumption in the ACT

Using data on Australian per capita egg consumption and other information, it is possible to calculate an estimated series of data describing egg consumption per capita for ACT residents from the 1980s to the 1990s. This shows egg demand to be falling. It is assumed that, while total egg demand would fall somewhat more over time, it would level out at 120 eggs per capita, from 131 eggs per capita in 1998–99. $EGG_t = 1/([1/\phi_7]+[1/\theta_7-1/\phi_7]*0.9197^t)$ is an estimated logistic function describing per capita ACT egg demand (in the absence of a ban), with the long run described by $\phi_7 = 120$ and the short-run by $\theta_7 = 131$.

In order to estimate total egg consumption (EGGDEMAND) in the absence of a ban, EGG is multiplied by the projected ACT population (POP_t) times (1 - 0.04) to remove backyard production. The population data are from the ABS (Cat. No. 3222.0) for 1998–99 to 2050–51, with the assumption that the population continues to grow by 0.12 per cent per annum afterwards.[5]

It is then possible to estimate egg demand (in millions of dozen) for the relevant categories of eggs consumed directly (or indirectly) by households by multiplying the total egg demand by the respective market shares:

$EGG_{BC,t} = MKTSH_{BC,t} * EGGDEMAND_t /(1{,}000{,}000 * 12)$ which is demand for battery cage eggs in the absence of a ban.

$EGG_{BL,t} = MKTSH_{BL,t} * EGGDEMAND_t /(1{,}000{,}000 * 12)$ which is demand for barn-lay eggs in the absence of a ban.

$EGG_{C,t} = MKTSH_{C,t} * EGGDEMAND_t /(1{,}000{,}000 * 12)$ which is demand for battery eggs for use in cafes and restaurants in the absence of a ban. It is presumed that, after a ban, the demand for such eggs is met by barn-lay eggs. The analysis also assumes that there is effectively no change in the demand for eggs by cafes and restaurants after a ban, because the percentage price change of the final goods incorporating eggs will be very small.

$EGG_{NEWBL,t} = BAN_t * EGG_{BC,t} * (1+\varepsilon. [R_{BL,t}/R_{BCNB,t} -1])$ which is the level of new demand for barn-lay eggs by former household consumers of battery eggs. ε is the price elasticity of demand for eggs, measured as -0.2.

D.6 Costs to consumers — direct consumption of eggs

New, 'forced', consumers of barn-lay eggs lose because they have to pay more for their eggs, as well as forgoing some egg consumption altogether:

$COST_{BC,t} = BAN_t * EGG_{NEWBL,t} * (R_{BL,t} - R_{BCNB,t}) + (EGG_{BC,t} - EGG_{NEWBL,t})* (R_{BL,t} - R_{BCNB,t})/2$

However, the costs to existing consumers of barn-lay eggs will be negative after the ban if retail margins are squeezed (through volume and/or competition):

$COST_{EXIST,t} = BAN_t * EGG_{BL,t} *(R_{BL,t} - R_{BLNB,t})$

[5] Consistent with trend growth rates over the last twenty years of the ABS projections.

D.7 Costs to consumers — indirect consumption of eggs

Householders also consume eggs as part of other products. The analysis ignores those products where the supplier is able to use pulped or powdered egg (most industrial applications and bakeries), but considers restaurants and cafes, where shell eggs may be more routinely used.

In this case, the cost arising from the ban for indirect consumption of eggs is:

$COST_{C,t} = BAN_t \,.\, EGG_{C,t}{}^* (C_{BL,t} - C_{BC,t})$

D.8 Retailers' and wholesalers' margins

Some of the apparent impacts of the ban on final consumers may reflect transfers from intermediate consumers — retailers and wholesalers. The costs to consumers ($COST_{BC}$ and $COST_{EXIST}$) include any changes in retail margins brought about as a result of the ban. If changes in margins reflect the costs of retailing and wholesaling (such as grading, packaging, transport, holding, advertising and other costs, including a normal return on capital), then it is appropriate to count these as economic costs. However, if some of the changes in the margins represent changes in profits to retailers and wholesalers, then these are transfers, rather than economic losses, and should be netted out in the final count of the economic impact.

The change in profits for intermediate consumers is (where the subscripts follow the earlier conventions):

$\Delta PROFIT_t = (PROFIT_{BL,t} - PROFIT_{BC,t})\, EGGNEW_{BL,t} + (PROFIT_{BL,t} - PROFIT_{BLNB,t})\, EGG_{BL,t}$

Each of these profits can be seen as a percentage of the gross margin between retail prices and farm-gate prices:

$PROFIT_{BL,t} = \mu_1 \lambda (R_{BC,0} - C_{BC,0})$

$PROFIT_{BC,t} = \mu_2 (R_{BC,0} - C_{BC,0})$

$PROFIT_{BLNB,t} = \mu_3 (R_{BL,0} - C_{BL,0})$

where the μ terms are the shares of gross margins representing a return above the full[6] economic costs of getting unpackaged eggs to the final consumer. μ_1, μ_2 and μ_3 are, respectively, the profit share for barn-lay eggs (after the ban), battery cage eggs (before the ban) and barn-lay eggs (before the ban). It is then possible to derive the change in profit as:

$$\Delta PROFIT_t = (\lambda\mu_1 - \mu_2)\ (R_{BC,0} - C_{BC,0})\ EGGNEW_{BL,t} + \{(\lambda\mu_1)\ (R_{BC,0} - C_{BC,0}) - \mu_3\ (R_{BL,0} - C_{BL,0})\}\ EGG_{BL,t}$$

For instance, it can be seen that if $\lambda = 1$ and $\mu_1=\mu_2=\mu_3$, the first component of the above expression vanishes (which would occur if the cost of retailing/wholesaling high volumes of barn-lay eggs was close to that of battery eggs now). With $\lambda = 1$, the second component represents a loss of profits to retailers and wholesalers (which partly offsets the gain made by existing barn-lay consumers). In the standard set of parameters, it is assumed that $\lambda = 1$ and $\mu_1=\mu_2=\mu_3=0.2$. However, also examined is a scenario where all margins represent economic costs (and therefore $\mu_1=\mu_2=\mu_3=0$). If this were the case, then there is no cost to retailers and wholesalers from the shift.[7]

D.9 Total costs to consumers and intermediate users

Accordingly, total costs from the ban are:

$$TOTCOST_t = COST_{BC,t} + COST_{C,t} + COST_{EXIST,t} - \Delta PROFIT_t$$

The costs of the ban are projected into the future (until the discounted value of the costs for the last year are effectively zero). The present value of these costs (discounted to 2005–6) are:

$PVCOST = \sum_{t=0}^{\infty} \frac{TOTCOST_t}{(1+r)^{t-8}}$ where r is the discount rate, set at 0.07 and t = 0 is 1998–99.

The perpetuity (payable from 2005–6) needed to fund this liability is:

$$PERPET = \frac{r}{(1+r)} PVCOST$$

6 Including depreciation and a normal rate of return on capital.

7 This does not mean that profits, in the business sense, are zero. Rather, the profits are just sufficient to justify the investments made, so that economic profits are zero — or there are no incentives for further entry by competitors.

Table D.1 shows the major components of TOTCOST for the first ten years of the ban (in undiscounted form) for the standard set of parameters. Table D.2 indicates how different assumptions about key parameters affect the overall estimate of the cost of the ban (using PERPET as the preferred cost measure).

Table D.1 **Costs to consumers (standard parameter settings)**

	COSTEXIST	*COSTBC*	*COSTC*	*∆PROFIT*	*TOTAL*
	$m	$m	$m	$m	$m
2005-2006	-0.048	0.803	0.141	-0.010	0.905
2006-2007	-0.050	0.770	0.137	-0.010	0.866
2007-2008	-0.053	0.741	0.133	-0.011	0.831
2008-2009	-0.055	0.715	0.129	-0.011	0.800
2009-2010	-0.057	0.691	0.126	-0.011	0.771
2010-2011	-0.060	0.670	0.123	-0.012	0.745
2011-2012	-0.062	0.650	0.121	-0.012	0.721
2012-2013	-0.064	0.632	0.119	-0.013	0.700
2013-2014	-0.066	0.616	0.117	-0.013	0.680
2014-2015	-0.068	0.601	0.115	-0.014	0.661

Source: Commission estimates

In summary, the Commission's best estimate of the consumer impact of the ban is a permanent yearly cost of about $0.65 million from 2005–06 onwards — or about two dollars per ACT resident per year. Most of these costs (of the order of 90 per cent) are a consequence of higher prices for eggs directly bought by households. The estimate is robust to many small changes in the parameters. However, larger costs — up to an extreme of $2.9 million a year — may be obtained by making no allowance for future cost reductions or other aspects of the future. More optimistic settings — for instance, faster technological progress in barn-lay production — would make the annual costs smaller than $650 000 a year.

Table D.2 **Costs to consumers (under alternative assumptions)**

No.	*Parameter settings*	*Perpetuity*	*Loss in 2005-06*	*Remarks*
		$m 1998–99 prices	$m 2005–06 prices	
1	R_{BC0} = 2.86	0.641	0.901	Base battery cage prices are slightly lower (based on the Commission's survey data).
2	R_{BL0} = 3.89	0.607	0.879	Base barn-lay prices are slightly higher (based on the Commission's survey data).
3	$\lambda = (R_{BL,0} - C_{BL,0})/(R_{BC,0} - C_{BC,0})$	1.145	1.387	Barn-lay consumers get no discount on the retail margin after the ban.
4	$\phi_1=1$	0.667	0.912	Small extra costs to consumers because long run costs of eggs fall by less.
5	$\phi 2=C_{BL,0}/C_{BCNE,0} - 1$	1.181	1.302	Barn-lay production costs don't fall over time.
6	$\phi_3=0.9$, $\phi_4=0.65$, $\theta_3=0.9$, $\theta_4=0.65$	0.674	0.948	The household market share is bigger (at 90 per cent) and the catering industry smaller.
7	$\phi_5=0.095$	0.655	0.909	The free-range market share does not grow at all.
8	$\phi_6=0.952$	0.726	0.946	The battery cage market does not decline in the absence of the ban.
9	$\phi_7=131$	0.690	0.942	Total egg demand per capita does not decline at all in the absence of the ban.
10	$\mu_1=0$, $\mu_2= 0$, $\mu_3 = 0$	0.633	0.896	Retailers and wholesalers claw no 'excess' profits from existing barn-lay consumers.
11	Settings 1 to 10[a]	2.848	2.729	Simultaneous realisation of all of the above. Note that setting 3, 5 and 10 explain most of the higher amount.
12	Our projection	0.648	0.905	

a We also tested the implications of having much bigger battery egg demand than ABS figures suggested, as well as 'pessimistic' views about prices and future cost reductions. For example, if parameter settings 1, 2, 3, 4, 5, 6 and 10 hold, as well as $\phi_5 =\theta_3=0.05$, $\phi_6 =\theta_6=0.98$ and $\phi_7 =\theta_7= 152$, then the perpetuity is $3.63 million per year and the first year costs of the ban are $3.48 million. These settings are similar to those used by the AEIA.

E Retail prices in the ACT

The Commission obtained summary data on retail prices of different eggs from the Australian Supermarket Institute (see chapter 6), but also independently collected information from a wide range of retail sites throughout the ACT. The information related to prices, carton sizes, the mode of production (free-range, battery cage or barn-lay), whether the eggs were on 'special', whether battery eggs were 'vegetarian', 'Omega 3' or 'standard', and the nature of the retail outlet.

Altogether 218 observations were collected on egg prices in the ACT from 21 stores (including major centre supermarkets, smaller suburban supermarkets and small shops, such as butchers). Non-battery eggs were available from all of the major centres and suburban supermarkets sampled.

Using regression analysis we modelled the (log of the) price per kilogram of eggs as a function of the production mode, whether eggs were vegetarian or omega 3, the number of eggs in the carton, whether the eggs were on special, the per egg weight and whether the shop selling the egg was a supermarket or some other outlet. All variables were found to be significant, and had the expected impact on egg prices per kilogram.

We were then able to project the price of any sort of egg, depending on its characteristics (table E.2). Notably, the price of a dozen 59 gram eggs purchased from a supermarket (and not on special) was projected to be $2.85 for battery eggs and $3.87 for barn-lay — a 35 per cent price difference. This is somewhat higher premium than found by the Australian Supermarket Institute, though the difference may reflect the fact that the Commission data are not weighted by the volume of sales.

Table E.1 **Regression model of ACT egg prices per kilogram**

	Variable	*Coefficient*	*t statistic*
1	Constant	3.767	18.1
2	FREE	0.304	22.0
3	BARN	0.309	20.4
4	OMEGA	0.260	14.5
5	VEGETARIAN	0.344	19.3
6	log (EGG NUMBER)	-0.109	-8.4
7	SPECIAL	-0.096	-4.0
8	log (PER EGG WEIGHT)	-0.577	-11.8
9	SUPERMARKET	0.248	6.6

a The dependent variable was the log of the egg price per kilogram. The number of observations was 214 (with 4 of the 218 original observations being excluded as outliers). The R^2 was 0.86, while the F test of the joint significance of the parameters was F(8,205) = 159.5, while the standard error of the estimate was 0.071.

Source: Commission calculations.

Table E.2 **Prices for 59 gram eggs in the ACT sold in supermarkets**

Type of egg	*Carton size*	
	12	6
$ per kilogram	$	$
Battery (standard egg)	4.02	4.34
Battery (vegetarian)	5.67	6.12
Battery (Omega)	5.22	5.63
Free-range	5.45	5.88
Barn-lay	5.47	5.90
Index of price (standard 12 = 100)	Index	Index
Battery (standard egg)	100.0	106.5
Battery (vegetarian)	140.7	147.2
Battery (Omega)	126.0	132.5
Free-range	130.6	137.1
Barn-lay	136.1	142.6

Source: Commission estimates using the above model.

F The expected lifespan of hens

The expected lifespan of hens was estimated using the following set of calculations:

$N = MIN(INT([1/\mu]*52),[6*52]-20)$

$DEATH_t = \mu/52*POP_0$ for t=21 to 72 and

IF ($t<N+20$) and ($t>72$) then $DEATH_t = (1-\mu)* POP_0/(N - 52)$

IF($t = N+20$) then $DEATH_t = POP_{t-1}$

IF($t > N+20$) then $DEATH_t = 0$

$POP_t = POP_{t-1} - DEATH_t$

$$AVLIFE_t = \frac{\sum_{L=21}^{t} DEATH_L \times L + (POP_0 - \sum_{L=21}^{t} DEATH_L) \times t}{POP_0}$$

where:

N	is the number of years that a hen will live (with linear mortality rates and a maximum life of six years);
INT	denotes the integer value of an expression;
MIN	is the minimum of two numbers;
μ	is the annual mortality rate experienced in the period from 20 to 72 weeks;
POP_0	is the initial population of hens at the end of the 20th week;
POP_t	is the population of hens in week t; and
$DEATH_t$	is the number of deaths in week t.

The Commission was informed that linear mortality was a good approximation to the actual pattern of mortality over the 20 to 72 week period, but trials with a variety of alternative, more complex, patterns gave similar results to that above.

The value of AVLIFE at t=312 weeks (or 6 years, the maximum life of a hen in this model) is the estimate of the expected lifespan of hens associated with a particular mortality rate that are allowed to live to their maximum life. The value of AVLIFE for any other value of t is the expected lifespan of a hen when all surviving hens in a flock are slaughtered at time t. For example, $AVLIFE_{72}$ is the expected life of a hen in a flock where all hens are slaughtered at the end of the 72nd week.

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