



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

The Economics of Regulated Changes to the Australian Egg Industry

Ray Trewin
Australian National University

44th Annual Conference of the Australian Agricultural
and Resources Economics Society
Adelaide, South Australia
22-25 January 2001

AJRC, Building 13, Australian National University, Canberra 0200

The Economics of Regulated Changes to the Australian Egg Industry

Abstract

The Australian egg industry is facing adjustment pressures including from animal welfare developments. Production and consumption of free-range eggs are rising in response. However, considerations have been given to banning the dominant conventional cage production as in Switzerland. Consideration has also been given to compulsory labelling eggs by their form of production. A focus of the research is to develop possible future scenarios and to value any associated animal welfare benefits against the cost of changes. The extent of market failures such as negative externalities from the consumption of conventional cage eggs will be an important aspect of the analysis.

Key words: egg production systems; animal welfare; non-market values

Acknowledgments

Funding for the project of which this paper forms a part was provided by the Rural Industry Research and Development Corporation (RIRDC). The author would like to acknowledge comments on a draft of aspects of the paper by a project Management Committee involving Irene Gorman and Jeff Davis, RIRDC; Philip Szepe and Paul Bartter, egg producers; and Rob Delforce, ABARE. The paper benefited from useful discussions and some background material from Ruth Badertscher, Swiss Federal Research Station for Agricultural Economics and Engineering; Jacques Degbelo, WTO; Jeff Bennett, ANU; Richard Bennett, University of Reading; Peter Frykblom, Swedish University of Agricultural Sciences; Sam Laird, WTO; John P McInerney, University of Exeter; Hugh McMahon, Australian Egg Industry Association; John Newton, National Farmers Union; John Rolfe, Central Queensland University; Peter Thomas, Department of Foreign Affairs and Trade; and Rhonda Treadwell, ABARE. Some research assistance was provided by Marpudin Azis.

1. Introduction

Following a meeting in March 2000 of the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ), it was agreed to consult widely with industry, animal welfare groups and the community on a discussion paper to be based on a task-force report on a Review of Layer Hen Housing and Labelling of Eggs in Australia (AFFA 2000). There was also agreement to develop a national quality assurance program addressing animal welfare issues, hen health, food safety and biosecurity.

Subsequent developments included a Layer Hen Housing Conference held on the Gold Coast over 11-12 July 2000 that was conducted by the Standing Committee on Agricultural and Resource Management (SCARM) Working Group and involved selected industry and animal welfare organisations.

The report of the Layer Hen Housing Conference was noted in the August 2000 ARMCANZ meeting where Ministers agreed hen welfare was a most important matter but that welfare considerations would not be divorced from food safety, biosecurity matters, and the economic realities of production. In fact, on occasions it is impossible to separate some of these aspects from the others. Ministers also reaffirmed that all chicken systems needed to have standards and be underpinned by quality assurance systems and labelling. Ministers considered a number of recommendations to be taken back to their jurisdictions including standards and associated measures for the future of layer hen housing in Australia (ARMCANZ 2000b).

The ARMCANZ recommendations did not include banning conventional cage systems nor compulsory labelling which were under consideration in the earlier deliberations. However, these issues remain important, for example because the recommendations mention contemporary standards which are continually evolving with R&D of layer hen housing systems. ARMCANZ specifically mentions these developments in its recommendations to review progress in such systems in 2005. Moreover, the domestic and international pressures that raised the issues in ARMCANZ in the first place have not gone away.

This paper addresses the economic aspects of these developments. There are two main and inter-linked components to these developments that this paper specifically considers and these are reflected in the detail of the Media Release following the March ARMCANZ meeting (ARMCANZ 2000a). These are:

- consultations with stakeholders on the potential for and costs of phasing out conventional cage systems in favour of alternative systems¹; and
- the development of national standards for labelling eggs with their production methods, so consumers can make more informed choices, with industry leading the development of quality assurance and labelling systems.

¹ Systems are interpreted broadly, covering pre- and post-laying stages, and beak trimming practices. Similarly, potential is measured broadly, taking into regard international developments such as moves to only introduce alternative systems into the European Union (EU) by 2012.

The next section considers the impacts and issues of alternative egg production and labelling systems. This is followed by a section in which some preliminary analysis is undertaken on data that are available on the issues, including on animal welfare benefits². An approach to developing possible future scenarios, including their full implications, is outlined in the penultimate section. The final section draws some conclusions.

2. Impacts and issues of alternative egg production and labelling systems

The implementation of the two main components, alternative egg production and labelling systems, would have some significant impacts and raise a number of issues. Some of these issues were discussed by selected industry and animal welfare organisations in the SCARM conference in mid-July but will need to be discussed more widely in the community if the sentiments in the ARMCANZ Media Release (ARMCANZ 2000a) are to be met.

Basis for assessment of change – social cost-benefit analysis

There has been increasing concern with animal welfare issues such as conventional cage egg production systems in many countries, including Australia. This has been reflected in market trends in egg consumption, production and so on. But what should be the basis for any change in such production systems in respect of animal welfare issues?

Traditionally, legislation imposing certain welfare standards has been the main basis for addressing this issue. Often these standards are based on scientific assessment, for example of animal behaviour, feelings or functions such as egg laying, on which there is often scientific disagreement and tend to be static over time. Sometimes these changes are just based on political considerations.

There are a number of questions that policy makers need to have answered in such an approach (Bennett 1997b). One question is will animal welfare be improved? Some alternative production systems may improve some aspects of ‘animal welfare’, such as increase a hen’s ‘space’, but worsen others, such as the threat of cannibalism. Scientific assessment will have a strong role here but may not resolve the question.

Another question is will the new legislation have general public support? Any legislation imposing animal welfare standards is likely to represent the values of some members of society but not those of others, with overall general public support needing to be determined, not just that of the more vocal.

² The project of which this paper forms a part concerned identifying the potential benefits and costs of change, not measuring these although some preliminary measures are provided. The SCARM deliberations could have resulted in a ban on conventional cage production without full consideration of the economics of such action. The onus should be on providing a strong case for such regulatory action, along the lines of a regulatory impact statement. That is, show that the benefits of such regulations more than balance the extra producer and other costs. The onus should not be on the reverse situation of having to show strong evidence that the uncertain benefits of a ban do not outweigh the more certain costs.

A final question is will introducing the new legislation be politically feasible? Here the economic consequences will be relevant, including the impact on international competitiveness. Some animal welfare approaches may be beyond general community values, and be inconsistent with a commercially viable and competitive industry producing a reliable, safe and affordable supply of eggs.

In a legislative approach, economic considerations have tended to be secondary, involving just costing or investment exercises, such as determining the economic costs of new legislative standards (Abdulla and Rodriguez 2000), or how costs could be minimised within new standards (cost-effectiveness analysis). This is only dealing with the supply-side costs of the market, and not the benefits as reflected on the demand-side. However, this situation is changing in some areas, for example formal cost-benefit assessments are now required for many environmental issues in the United States.

As suggested in the differing animal welfare values of various members of society, animal welfare issues are 'matters of social choice made by collective and individual decisions rather than scientific assessment' (McInerney 1991). These values will vary not only over individuals and collectives within a society, but also over societies and over time with the development of alternative production systems, incomes, and so on. This perspective has animal welfare as a component of human welfare whose importance is reflected in the effect it has on people's utility. Thus the social choices will involve trade-offs of limited resources between allocations for utility from the animal production and for utility from animal welfare.

An individual's utility can relate not only to it's own consumption decision but also to that of others. If utility depended just on an individual's own consumption decision, and there was no market failure in providing full information on the situation (see later), then animal welfare may be left to the market. This would be especially the situation when all decision choices were included and appropriately valued in the market. For example, suppose a choice between conventional cage and free-range eggs represented all individual preferences, ignoring for the moment a 'no eggs' preference based on animal welfare grounds. In this situation, individuals may be able to purchase free-range eggs at a premium and thus achieve their preferred animal welfare outcomes for themselves.

However, the utility of some individuals, such as non-consumers, may be affected by the consumption decisions of others ('I am worse off by your consumption of conventional cage eggs') – what is known as a negative externality in economic jargon. Other negative externalities would be pollution costs from various forms of egg production. Yet another would be the loss of freedom of choice for some people with the introduction of bans. A negative externality cannot be fully addressed in the free market even with the option of consuming animal welfare 'friendly' free-range eggs being available. Such a situation of conventional cage egg production also creating a negative animal welfare output that is not being fully valued in the market is similar to the situation of a non-priced good – too much of it exists in a free market situation. Of course, if these negative externalities are not significant, and consumers have full information, then animal welfare could be left to a market providing an option of animal welfare 'friendly' free-range eggs.

When the status quo is not appropriate then there are two basic approaches to addressing this, namely regulation and market correcting. The regulation approach has a number of disadvantages, for example it has been shown that such approaches can hold back innovation and other cost saving aspects. In the market correcting approach, strengthening property rights (e.g. brands with animal welfare credentials), taxes (the 'polluter pays' principle) and subsidies of good animal welfare practices may need to be introduced to achieve a socially desirable level.

Economics is particularly useful in analysing such limited resource allocation situations, for example by analysing the social costs and benefits of the alternatives, including non-market values, to see if there are net social benefits from change, and who's gains may be able to compensate any other's losses (see Bennett 1997a and Productivity Commission 1998).

The relationship between animal production and welfare

A description of the relationship between animal production and welfare given in McInerney (1991) and Bennett (1995) will make the trade-offs between utility from animal production and from animal welfare clearer. This situation is represented in Figure 1 which illustrates the production possibility frontier for perceived farm animal welfare and the production of livestock products. The slope of the lines tangential to this frontier represent the relative values given by society to farm animal welfare and livestock products. The figure also incorporates the societal indifference function for these attributes.

(Insert Figure 1 around here)

When there is no farm production use of livestock then livestock will tend to be more neglected and animal welfare will suffer. As production-intensity increases this tends to reach a stage where animal welfare starts to decline. It could even intensify to a stage where animal production as well as animal welfare declines.

Society would wish to be somewhere on this production possibility frontier where resources are used efficiently, which will be where both animal production and welfare could not be improved. This point will be somewhere between where production-intensity starts to lead to a decline in animal welfare and where it starts to lead to a decline in animal production. What society is willing to trade-off in terms of utility (or values) it receives from animal production and that it receives from animal welfare will determine where it will lie on this part of the production possibility frontier. If society put an infinite value on animal welfare then the point of interest would be the level of production-intensity and production where animal welfare is maximised. If it put no value on animal welfare then the point of interest would be where animal production is maximised.

The difficulty in applying this framework is, as mentioned above, that the value of animal welfare is not fully reflected in the market, or the market point C differs significantly

from X which reflects society's preferences. However, premiums for free-range eggs may be reflecting some or even most of the value of animal welfare, that is point X and C in the figure are close together.

As highlighted above, there is a need to value the utility society receives from animal welfare to apply an economic social cost-benefit analysis framework, even if no market exists. Value is often measured in terms of people's willingness-to-pay for a particular outcome delivering this utility. This is often difficult to measure. For example, people may not be well informed of the animal welfare situation or the product they are buying.

Information

There may be a role for government in providing information on the animal welfare situation, for example requiring labelling of production methods (if these can be agreed), and funding an education campaign for society to have a better appreciation of the animal welfare implications of all methods of production. Existing trade practices and fair trading legislation already address the labelling issue, as might public health legislation.

Other institutions may also have a role here, such as the RSPCA whose main approach to the issue of conventional cage egg production in the UK has been to let 'humane' farmers not producing eggs in conventional cages to pay to use its Freedom Food logo which draws a premium from consumers. This is 'a voluntary and morally educative rather than coercive and morally dictatorial' approach to the issue (The Economist 1995). Quality is demonstrated through a logo or brand reputation, which the costs of losing would not be worth risking (Productivity Commission 1998), and does not require expensive '3rd party' government involvement. Similar approaches are currently being applied in Australia for barn but not free-range eggs.

There are obviously costs from providing information such as through enforcing labelling and mounting education campaigns but are there corresponding benefits to cover these costs? It would appear from market surveys that the number of free-range eggs that are produced within production systems that satisfy such a label are much less than the number that consumers say they are buying (Animals Australia 1998). There is probably an element of poor survey design, over-reporting by survey respondents who feel they look better if they say they are buying free-range eggs, as well as an element of 'mislabelling'. Given this possible excess demand situation for true free-range eggs, truer labelling might settle down to a situation where a higher premium was being paid but perhaps for a different number of true free-range eggs.

It would be in the interest of those able to extract higher premiums from free-range eggs to ensure the bona fides of the labelling, along the lines of the 'humane' farmers and RSPCA partnership described in The Economist article (The Economist 1995). They would also have incentives to introduce effective self-regulation. No expensive legislative approach may be required in such an approach.

Revealed values of animal production and welfare

As mentioned above, sometimes value can be revealed in market transactions, including non-market values such as for animal welfare. One approach, hedonic pricing, builds on the fact that the price some people are willing to pay for consuming some good like eggs incorporates other aspects such as animal welfare concerns. This might be the situation with free-range eggs, with consumers paying a premium for these in the belief that this will foster what they perceive to be a more animal welfare friendly form of production. However, this premium may be reflecting just the opportunity cost to consumers, that is what they are paying, not their greater willingness-to-pay.

Moreover, other aspects of free-range eggs have been suggested as drawing this premium, for example better taste, quality, helping small producers, and better for the environment and health. This last aspect has been the key reason given for purchasing free-range eggs in some Australian consumer surveys (Rolfe 1999), whereas welfare has been given in other consumer surveys (Animals Australia 1998). Whatever reason is presented, a social cost-benefit framework can be applied although some reasons may have less of a social or public good rationale for using legislation to impose a production system.

Expressed values of animal production and welfare

As also discussed earlier, not all values can be revealed in market transactions. Some people may not consume eggs but still gain utility in having eggs produced in certain ways. In such situations, expressed values of members of society need to be obtained from surveys. Approaches such as the contingent valuation method (CVM) have been developed to deal with this case (see Bennett and Larson 1996). An added advantage of such approaches is that they can deal more directly with obtaining values for new situations that are currently not being experienced by society. The CVM is a non-market valuation technique where people are asked hypothetical questions in a structured survey about their willingness-to-pay for different situations. The CVM has a number of limitations, for example it is often difficult to differentiate between the various influences that contribute to the responses chosen ('I buy free-range eggs for both health and animal welfare reasons').

Newer techniques such as choice modelling (CM) are being developed that provide richer information (see Rolfe 1997 and Bennett 1999). Similar questions are asked as in a CVM but instead of one question, a selective set of choices based on experimental design, each different in terms of the 'environmental' outcome and financial implications, is asked which enables each influence to be differentiated.

General supply-side impacts

If legislation was introduced recommending alternative egg production systems such as free-range, or compulsory labelling, then there would be a sequence of broad impacts on various stakeholders beyond egg production, including marketing, processing, importing, consumption, plus these aspects for related products.

An initial impact on egg producers from the introduction of less efficient egg production systems would be an increase in production costs. The Productivity Commission (1998) has estimated that Australian farm production costs for barn systems, the next cheapest alternative to conventional cage systems, are on average around 35 per cent higher – \$1.70 per dozen compared to \$1.25. Production costs for free-range eggs are estimated at about 25 per cent higher than those for barn production or around \$2.15 per dozen. More restricted cost estimates by Abdulla and Rodriguez (2000) are discussed later. These costs should take into account aspects such as higher levels of mortality in some production systems.

These estimates should also take into account possible substantial adjustment costs that would be involved in swapping egg production systems. Adjustment costs would include replacing cages before their economic life is reached but would not include relocation costs if these involved selling out of established locations for profitable redevelopment.

Even with no changes to production systems, but just labelling changes, supply costs would be increased, for example through the introduction of implementation and enforcement costs.

The higher production costs will in turn lead to higher retail prices, a fall in demand (given other prices have not increased in line), or an increase in cheaper imports, some producers leaving the industry because of lower profits, less investment for expansion, and changes in industry structure. Domestic industry will be smaller and more concentrated, and imports larger.

Processed product

The increase in imports could be in the form of processed products that currently do not face the same quarantine restrictions as shell eggs and whose market is growing more strongly. Processed products now makes up about 15-17 per cent of the Australian egg market (RIRDC 2000) but it is much higher at 30-38 per cent in other developed countries such as the United States (USDA 1997). McDonalds in Australia have increased their share of egg consumption from 1 per cent to 2.5 per cent in recent years.

Australian exports of processed foods containing egg products are much larger than those of egg products. This worldwide trend will raise the importance of the difficult issue of the source of processed product (conventional cage or free-range), along the lines of the issue of GMO ingredients in processed products. As described later, Switzerland has introduced some costly arrangements to address this issue.

International competition

Technological advances are likely to increase the chance of international competition from ‘shell eggs’ as well as processed product in the future (RIRDC 2000). Most of the growth in egg production is taking place in developing countries introducing conventional cage egg production with low labour costs. It should be noted that the WTO appears to be taking a stronger line against trade protective arrangements that are based

on questionable non-trade grounds, such as environmental and labour grounds that are better addressed more directly (for example, the WTO found against the US introducing trade barriers on shrimp imports not caught using a specific technology aimed at protecting sea turtles).

What other countries do will be important in terms of the impact of changes in Australia. For example, if the EU decides to introduce egg production systems that raise its costs, and it no longer subsidises its agricultural exports, then there will be less import competition in Australia and less impact from Australian producer costs being raised. However, it is believed by some in the EU that certain producer concerns with increased costs will result in the EU Directive not being followed by all member states. For example, the NFU feels the rest of Europe has a more liberal definition of free-range which would give them a cost advantage over the UK (NFU 1999). The Directive appears aimed more at addressing the EU egg surplus and protecting its inefficient agriculture by introducing animal welfare issues into trade arrangements, rather than animal welfare concerns. Regardless of the reasons, a general increase in costs will mean the impacts will be mainly from the demand-side.

Demand-side impacts

As mentioned in respect of the supply impacts, higher production costs will lead to higher prices, at least to the level of the increase in production costs but maybe less in percentage terms, and a decline in demand, other prices not changing. The relative retail prices of conventional cage, barn and free-range eggs are estimated at \$2.88, \$3.69 and \$3.85 per dozen, giving differentials of around 80 cents and \$1.00 per dozen (Productivity Commission 1998).

The extent of the decline in demand will depend on the responsiveness of demand to changes in price. The demand-side is particularly important as it can drive market developments, for example in the UK more free-range eggs are produced than cheaper barn eggs because of greater consumer demand.

An important aspect in the responsiveness of demand to changes in price is the proportion of budget spent on eggs. This will be more important for poor consumers and it is this group that the changes in arrangements impact most heavily – the relative burden is 4 times larger for low-income Australian households than average households (Productivity Commission 1998). Similar differentials exist between ethnic groups. Such differentials are evident in other countries such as the UK.

Another important determinant of demand responsiveness is the availability of substitutes such as imported eggs and processed egg products as discussed above. Processing has raised the substitution possibilities and also the responsiveness to price changes. But the substitution possibilities are greater than these more direct aspects as has been evident in recent years when traditional consumption of eggs has been replaced by consumption of non-egg products, for example eggs for breakfast with processed breakfast bars although changing tastes will be a factor here also.

Responsiveness of demand to price changes

Some analysis has suggested that consumers demand for eggs is not very responsive to price which implies that consumers will bear most of the increased costs from any changes, including costs related to the labelling regulation and education, and producers little (Bennett 1997a). Demand would then be a little less and producers would produce near what they were previously at higher costs but compensated by higher prices paid by consumers. This analysis is dependent on estimates of demand responsiveness in the past where prices changed little and econometrically do not appear like a major explanator of demand (Oczkowski 1999). It is also dependent on little competition from imported and substitute products.

But the changes suggested in respect of banning conventional cage egg production would involve major changes in costs and prices, and demand could be much more responsive to these type of changes. Information on likely demand responses to large price changes could be obtainable from surveys of consumers' intentions. Previous surveys have suggested that 19 per cent, or around 1 in 5 consumers, would not be willing to pay more for eggs (Animals Australia 1998).

Impacts outside of the egg industry

There are a number of broader impacts that could flow from the regulation of alternative egg production systems or labelling of egg products on the basis of their form of production. Firstly, conventional cage egg production is viewed as being similar in respect of animal welfare issues as other intensive agricultural production systems such as intensive pork and beef production. Thus the bounds of the social cost-benefit analysis may need to be widened to take into account aspects such as the adjustment and other additional costs in all intensive livestock production, along with the benefits of broader animal welfare improvements.

There could even be broader trade impacts. If Australia banned any products from a form of intensive livestock production, including imports, then it would find it more difficult to argue in international trade forums that trade should not be distorted on non-trade grounds such as those concerned with the environment, labour and animal welfare.

Alternative egg production systems leading to increased imports, including of egg products and inputs to the alternative egg production systems, raise the risks of quarantine-related diseases. This could adversely affect the poultry and other livestock industries, as well as native birds and animals. Again this possibility would require the bounds of the social cost-benefit analysis to be widened.

3. Data and preliminary analysis of the costs and benefits of banning conventional cage production and compulsory labelling

The above discussion of impacts and issues establishes a framework in which the social costs and benefits of changes can be determined and compared. In this part, the necessary data is identified and presented where available to enable some preliminary social cost-benefit analysis to be undertaken. The data is identified and presented in two parts, first

in respect of the Australian situation and, second, in respect of relevant overseas information on the costs and benefits of banning conventional cage egg production. Labelling information is dealt with separately.

Domestic data on the impacts of banning conventional cage egg production

It is important in terms of impact estimates to have a good appreciation of the size of the Australian egg industry. The Australian egg sector is an important industry, currently producing around \$300 million worth of eggs per annum³. Investment in land and equipment is much larger. The Productivity Commission (1998) estimated employment at around 2,500 paid and 1,700 'unpaid' family employees. Although much of this employment is around major population centres there is a significant component in regional areas such as around Tamworth where feed and other inputs are readily available. Eggs are an important input into some processed and service industries (e.g. fast food restaurants). Processed egg products have been stated to be around 17 per cent of total value but are growing fast towards United States near double levels of processed products. Australians on average consume around 11-13 dozen eggs per annum. The poor consume relatively more eggs and the relative budget burden on eggs is 4 times more for them than that of average households. Australian imports and exports of eggs and egg products are currently only around 1-2 per cent of the domestic market (Productivity Commission 1998). The egg industry is facing similar animal welfare issues as other livestock industries such as poultry meats, pork and intensive beef whose contribution to GDP, employment, etc would be much larger than that of the egg industry.

What revealed animal welfare values from alternative egg production systems are apparent in the market? There are three forms of production that have been discussed – conventional cage, barn and free-range – that on occasions have not been clearly distinguished, for example in willingness-to-pay responses, but which have different costs. The proportion buying free-range, including from backyard production, has been estimated between 7-13 per cent with Rolls (1995) giving an estimate of 9 per cent and the Productivity Commission (1998) an estimate of 10 per cent. These proportions will differ between states, for example WA produces relatively more conventional cage produced eggs as it can export these to neighbouring countries, and within states with some producers specialising in barn production, etc. The Productivity Commission (1998) estimates barn production at around 4 per cent. Currently there is an excess supply of such eggs. The free-range percentage is much less than the percentage who have said in surveys they are buying free-range eggs, between 44-48 per cent according to Rolfe et al (1997). The current premium for free-range eggs is between \$1.00 to \$1.50 per dozen. The Productivity Commission (1998) estimates the premium for barn eggs at around 80 cents per dozen. But not all of these premiums might be for animal welfare reasons as in some surveys respondents have given more natural and healthier as the main reason for purchasing such eggs (Rolfe 1999). Regardless of the reasons, this information can still

³ Even information on egg production is uncertain, especially following the deregulation of the industry, for example as a result of backyard production estimated to be around 16 per cent of total production (Rolls 1995, McMaster 2000). Some estimates put the industry's gross value of production higher at around \$350 million.

be put in a social cost-benefit framework analysing the merits of alternative egg production systems.

In a social cost-benefit analysis, such benefit estimates have to be weighed up against the extra costs involved in producing eggs under such a system, as well the differential effect on quantities⁴. The Productivity Commission (1998) estimated that these costs would be around 45c/dozen (\$1.70 minus 1.25) for barn (35 per cent higher), and 90c/dozen (\$2.15 minus 1.25) for free range, ignoring adjustment costs. These convert to corresponding differences of around 80c/dozen (\$3.69 minus 2.88) and around \$1.00 (\$3.85 minus 2.88) at the retail level. Based on various sources of information (e.g. Amgarten and Meirhans 1992), the Productivity Commission feels the production cost differentials will decline in the longer-term to 10-16 per cent for the 'preferred' barn production⁵ as this is a relatively new technology, especially in Australia, and offers more potential for productivity gains. This would take the 80 cents down to 23-37 cents. However, analysis by Larkin (1993) suggests most of the gains from deregulation have gone to supermarkets and if this continued, margins would be maintained and differentials remain higher. No discussion is given in Productivity Commission (1998) of free-range egg production costs in the longer term but it is an old technology where few gains could be expected.

On the other hand, adjustment costs which are broader than depreciation costs will be significant (NFU 2000). New capital investment in barn systems are about \$32 per bird (Productivity Commission 1998). And many of these adjustment and other costs will result in higher costs in downstream industries, for example the smaller scale of operations associated with non-cage egg production will raise distribution costs. The Productivity Commission (1998) assumed these latter costs would be insignificant. The Productivity Commission (1998) has the capitalised value of direct adjustment costs in the ACT at around 45 per cent of the long-run production cost to consumers. These are likely to be larger at around 60 per cent on an Australian-wide basis seeing the ACT would have obtained eggs from interstate producers that would not have been affected by an ACT ban. The 45 per cent figure on the 80 cents would be 36 cents and the 60 per cent figure would be 48 cents. Adding these to the above cost differentials of 23 cents to \$1.00 would give a lower bound of 60 cents and an upper bound of \$1.48⁶.

⁴ With some other changes, such as the adoption of new bio-security procedures, it might be appropriate to assume that they have the same impact on all systems.

⁵ This is not been the situation in the UK where demand-side factors has led to more free-range than barn production despite higher costs.

⁶ Abdullah and Rodriguez (2000) have estimated producer costs under some strict assumptions. Assumptions include that the market (only the producer side as consumers are ignored) does not respond to higher prices and there is no change in domestic market supply, there being an absence of imports; that current supply elasticities apply; that one producer's costs are representative of the industry; and that investment is driven by producer prices and not necessarily profits. Some sensitivity analysis is undertaken, for example on different investment horizons as would be reflected in different economic lives of new cage investment. The estimates of production costs are higher in absolute terms than those of the Productivity Commission (1998) for barn production, although about the same in percentage terms, and lower for free-range production. The authors recognise the limitations of their approach and suggest a producer survey would be useful in better determining future costs.

In addition, there are the possible costs of negative environmental impacts, spillovers to other intensive livestock industries, loss of trade negotiating strength on non-trade issues such as animal welfare from the introduction of new production systems, and greater disease risks, that have not been costed.

Estimates of the overall additional costs at \$1.50 per dozen correspond to the upper bound free-range egg premium, as might be expected if there were no economic rents in the system and no scale economies in the alternative systems. This last aspect might be expected given that alternative systems are not as intensive as conventional cage egg production which does have significant scale economies.

Other important information concerns estimates of expressed non-market values. Relevant to this is the estimate produced from a survey for Animal Liberation Victoria by AGB McNair (1994) that 33 per cent of respondents were willing to pay at least 50 cents/dozen extra for eggs to provide hens with more room (which could be in cages). Animals Australia (1998) estimated that 44 per cent were willing to pay 50 cents/dozen or more extra for eggs if conventional cage eggs were banned. These numbers are inconsistent, with banning conventional cage eggs being a more drastic action, unless community values had changed over time⁷.

Thus for some 33-44 per cent of the population, the social benefits from an alternative egg production system outweigh direct costs of 50 cents per dozen from producing eggs within such systems. The trade-off of the social benefits against the social costs will decline as the remainder of the respondents not willing to pay 50 c/dozen for eggs produced within such systems are brought into the calculation. The amount willing to pay more than \$1.00 was estimated at around 29 per cent (Animals Australia 1998). Some 19 per cent said they were not willing to pay any more according to Animals Australia (1998). Using midpoint values and an upper limit reflective of the individual price ranges for the distribution of values people were willing to pay for eggs if conventional cages were banned that was obtained from Animals Australia (1998), average willingness-to-pay is estimated at around 60 cents per dozen, or in percentage terms an extra 21 per cent on a price of \$2.88. This estimate is around the same as the values of 50-69 cents per dozen (17-24 per cent) obtained from some other studies (e.g. Rolfe 1999). The 60 cents per dozen value is less than the estimated upper bound of \$1.50 in costs but about the same as the 60 cents lower bound estimate from Productivity Commission (1998) data. However, as pointed out by Andersson and Frykblom (2000), some expressing these willingness-to-pay amounts for a ban are already paying price premiums to consume free-range eggs in the market. Thus the comparison of extra costs against extra benefits, or willingness-to-pay for a ban needs to take this aspect into account, say by adjusting the willingness-to-pay estimates downwards.

No account has been taken in these calculations of the prospect of loss of market and the local production base to imports with the change in production system. The estimated

⁷ Estimates like these, as with any estimates based on survey approaches, can be subject to great uncertainty unless proper procedural aspects like neutral background information and lead-in questions are undertaken to minimise potential biases.

responsiveness of egg demand to price changes is low, around 0.15-0.20, but these were estimated when prices were more controlled and price changes small. Large price changes now could result in more responsive estimates. These could also result from the increase share of processed products. Domestic production would also be more responsive to large price changes if these resulted in imports taking market share.

There are similar issues on the supply-side as is evident from the NFU survey discussed in the next section that suggests supply responses could be much larger in reality than suggested by the responsiveness of egg supply as estimated from past data reflecting a different environment.

In summary, the 60 cents benefits versus \$1.50 costs result suggest that the value society puts on any animal welfare benefits from banning cages are not outweighed by the additional costs of achieving this outcome. The 60 cents benefits, without adjustment, versus 60 cents costs result suggests the situation is a line ball. More accurate information on the costs and the benefits would be required before a more definite conclusion could be reached.

International data on the impact of banning conventional cage egg production

There are a couple of major trends in international egg production and consumption that are highly relevant to the issues being discussed in this paper. These are the movement of production from developed to lower cost developing countries where conventional cage egg production is growing, and the shift into processed egg products rather than shell eggs.

Of more specific interest is the situation in Switzerland where a conventional cage egg production ban was implemented in 1981 with a 10-year transition. Egg production dropped dramatically in 1990 but has stabilised since (see Table 1). Production of near neighbours, such as France and the Netherlands, has been up. Exports, mainly of shell eggs, dropped like production, dramatically in 1980 and again in 1990, but there have been intervening periods where these have achieved the same levels as between 1980 and 1990.

Imports of eggs in the shell were initially up following the ban but have declined over the period. Imports of egg products, such as liquid, frozen and dried eggs, have increased over the whole period, reflecting a world-wide trend to processed products and a loss of competitiveness of Swiss egg processors with higher shell egg prices. There have been shifts in sourcing to intensive producers such as the Netherlands and Germany. However, overall imports of eggs and egg products declined. This last aspect is not surprising in some sense as Switzerland has introduced tariffs on eggs and egg products that are many times even the EU's high levels. They have even introduced some non-tariff barriers such as over 1996-2000, labelling requirements of the source of production of eggs and egg products, including in restaurants, the impact of which appears evident from the table. Information on imports of processed products containing eggs is not readily available but would have had to increased if Swiss consumers were to have maintained their overall egg consumption levels anywhere near pre-ban levels. Information from household

surveys shows that consumption of domestic eggs and egg products as a percentage of all eggs and egg products is less (49.2%) than that suggested from apparent domestic consumption derived from Table 1 (54.3%)(SFSO 2000). This suggests that there are leakages in the closed Swiss market, such as eggs brought across the border by individual consumers or in processed products, are significant. Switzerland has an unusually large proportion of egg consumption in product form, 33 per cent compared to 16 per cent in Australia, Sweden, and the United Kingdom, and 27 per cent in the United States, (McMaster 2000). There would have also been a continuing demand for eggs from large processors such as Nestle taking away from apparent consumption unless they moved more of their operations to lower cost countries.

Table 1: Switzerland egg production, imports and exports (Mt)

Year	Production	Imports (Shell)	Imports (Products)	Total Imports	Exports
1979	43,557	24,218	7,580	31,798	263
1980	43,502	24,985	7,118	32,103	36
1981	42,499	26,965	8,337	35,302	31
1982	42,499	28,833	6,598	35,431	21
1983	44,727	28,069	6,807	34,867	7
1984	42,555	29,668	6,656	36,324	22
1985	43,166	30,089	6,844	36,933	34
1986	44,616	30,722	7,243	37,965	25
1987	42,499	33,233	6,655	39,888	31
1988	41,000	32,432	6,942	39,374	24
1989	40,200	29,920	6,549	36,469	26
1990	36,646	31,235	8,235	39,470	2
1991	36,274	30,983	9,457	40,440	1
1992	37,685	31,985	8,615	40,600	1
1993	35,659	26,490	8,839	35,329	0
1994	37,474	28,035	9,856	37,891	36
1995	34,305	25,200	10,064	35,264	36
1996	37,799	25,960	9,328	35,288	12
1997	38,327	22,719	10,576	33,295	1
1998	39,937	22,615	11,031	33,646	1

Source: FAO website

Some international estimates of expressed values are available for comparison with Australian estimates. Bennett (1997b) undertook a CVM of banning conventional cage egg production assuming no trade competition or adjustment costs impact on the cost increases. Unfortunately the survey had a large non-response rate of 70 per cent. Willingness-to-pay estimates were 43 pence, or 38 pence per dozen adjusting for method biases. These are around \$1.00 per dozen (with an exchange rate of \$2.56 to the Pound Sterling) which is larger than the Australian estimates of 50-69 cents per dozen. In percentage terms this is an extra 27-31 per cent on a price of 1.40 Pounds Sterling, which is also larger than the Australian percentages. Society in some countries put higher values on issues like animal welfare. The number of respondents that said they were not willing

to pay anymore for eggs was 14 per cent which compares to the 19 per cent figure obtained from the Australian survey (Animals Australia 1998). If the non-response is taken as a zero willingness-to-pay then the average willingness-to-pay goes from 43 to 13 pence, or from 38 to 9 pence when adjusted for biases. The corresponding percentages go from 6-9 per cent.

Additional production costs are estimated between 4 and 15 pence, or between 8 to 30 per cent. The upper bound is around 40 cents, which is at the lower range of Australian estimates, and the lower bound is near the lower bound long-run Australian estimates. But these costs ignore the impact of trade and the substantial adjustment costs which have been estimated at between 45 to 60 per cent of initial operating cost differentials. Some of the more significant costs are difficult to measure, for example those associated with obtaining new planning approvals to construct poultry housing (NFU 1999). Even ignoring these there is an overlap between the range of cost and benefit estimates. Again more accurate information would be needed for a more definite decision.

Work on the Swedish egg industry by Frykblom and Andersson (2000), and Andersson and Frykblom (2000) could not find empirical support that a ban on the use of cages in egg production increased human welfare. This work used a variant of a CVM aimed at minimising response biases from some respondents already paying a market premium to consume free-range eggs. The overall response rate was acceptable at between 52 and 55 per cent. It found the percentage of respondents willing to pay a positive amount for free-range eggs in the market (63%) was not significantly different from those willing to support a legislative ban (78%). In other words, the negative externality to society from allowing all consumers to choose their tradeoff between animal welfare and the price of eggs on the market is insignificant. If the negative externality to society of some consumers choosing conventional cage production was significant then this would have to be weighed up against other resultant negative externalities such as the loss of freedom of choice. Generally such non-market negative externalities are not taken into account so as to provide complete 'with' and 'without' comparisons.

Frykblom and Andersson (2000), and Andersson and Frykblom (2000) provide some dichotomous bids that can be used to calculate willingness-to-pay for free-range eggs in the market and through a ban. The estimated willingness-to-pay in the market was 4.6 SEK, or 46 per cent extra on the current price of 10 SEK for a 6-egg pack. (The exchange rate is about 17 Australian cents to the SEK.) The willingness-to-pay estimate for a ban was 11.4 SEK, which is outside the range of bids and over double the current price. This result appears driven by some outliers in the dichotomous bids with higher bids having higher 'yes' proportions than lower bids. Using robust regression techniques to lessen the influence of outliers, a more reasonable estimate of 6.8 SEK, or 68 per cent extra, was obtained. These percentage estimates are much higher than the Australian percentages of 17-24 per cent. Nonetheless, the differences in the estimates suggests the willingness-to-pay to overcome negative externalities from others consuming non free-range eggs is relatively small at 2.2 SEK or 22 per cent, supporting the analysis of the non-bid questions.

Frykblom and Andersson (2000), and Andersson and Frykblom (2000) also provide some reasons why survey respondents answered the way they did, whether this was accepting or rejecting the bid. Thus answers included both concern with the hen's and producer's situation. The largest reason in the legislated ban case was the hen's situation (85.2%) followed by egg quality (39.4%) and then producer's situation (10.6%). In the market scenario the corresponding values were 67.2%, 39.4% and 9.5%. Budget (11.7%) and Other reasons (14.6%) were larger than the Producer's situation in this last case.

The limited information on the United States situation presents willingness-to-pay estimates of around US35 cents per dozen or 18 per cent extra (Bennett and Larson 1996) which are around the lower end of the Australian estimates (using an exchange rate of around 52 US cents to the Australian dollar) and much lower than the UK and Swedish estimates. No cost estimates are given for comparison but the United States is a very efficient conventional cage egg producer and the differentials between these production costs and those of alternative systems could be larger than elsewhere. It is interesting to note that in a market-based systems such as the United States that some processors, such as McDonalds which takes about 2.5 per cent of United States production, are beginning to set strong welfare requirements regardless of government regulation.

Table 2 contains a summary the above estimates of willingness-to-pay and additional costs for alternative egg production systems. The different willingness-to-pay estimates over countries could reflect a number of factors such as shifting consumer demand, income levels, culture, political economies, and so on. Willingness-to-pay is generally less than additional costs, especially after taking into account that some premiums are already being paid in the market and taking fully into account adjustment and other costs. Some estimates have a large range which reflects uncertain information (e.g. adjustment costs) and an inaccurate methodology (e.g. no analysis of non-response rates).

Table 2: Willingness-to-pay and additional costs for alternative egg production systems (cents/dozen and percentage increase)

Country	Willingness-to-pay	Additional cost
Australia	50-69c (17-24%) (a)	60-150c (e)
UK	23-97c (6-27%) (b)	9-64c (f)
Sweden	75-150c (46%) (c)	Not available
United States	67c (18%) (d)	Not available

(a) Rolfe (1999). Range reflects differences between estimates of the mean and median.

(b) Bennett (1997). Exchange 2.56c per pence. Lower bound based on non-respondents having a zero willingness-to-pay.

(c) Andersson and Frykblom (2000). Exchange 17c per kroner. Lower bound based on non-respondents having a zero willingness-to-pay. Not significantly different from willingness-to-pay for a ban.

(d) Bennett and Larson (1996). Exchange 52c per \$US.

(e) Productivity Commission (1998). Range reflects mainly different production systems (e.g. barn, free-range).

(f) Bennett (1997). Impact of trade ignored and adjustment costs estimated from Australian levels.

Labelling costs and benefits

The introduction of labelling should be based on the balance of the costs and benefits of doing so, and not on the assumption that the lack of labelling has some cost and that its introduction will have some benefit.

The Productivity Commission (1998) believe that the labelling costs are small but give few details. It provided estimates of inspection costs for the ACT's two farms following the introduction of a ban on conventional cage egg production as \$20,000. For the 250-odd Australian farms such costs would amount to \$5 million. Enforcement costs following compulsory labelling could be of a similar order. All the costs associated with labelling, such as on-farm implementation, audit and enforcement costs, in the past have been large. This is presumably why such practice has not been introduced into countries such as the United States and UK. There would be additional associated costs such as truth in labelling and disease risk preventing the mixing of types (e.g. excess barn eggs being mixed with conventional cage eggs) and leading to wasted production.

The Productivity Commission (1998) also states that labelling could increase demand even at higher prices caused by labelling costs. However, this last aspect does not seem to have been the response to the compulsory introduction of labelling in the ACT with the market for free-range eggs staying the same. ACT egg consumers choices do not appear to have been distorted by any apparent 'mislabelling' (personnal communication Paul Bartter). This might have been expected given previous labelling practices that informed aware free-range consumers they were getting what they were looking for, but did not inform indifferent consumers they were getting anything other than what they were looking for (eggs).

4. Foresighting possible scenarios for the Australian egg industry

The stated purpose of the foresighting component of the project was to 'develop possible scenarios and their full implications'. For example, it is possible that the supply implications of a major change scenario such as banning conventional cage production could be quite different from past supply response estimates.

Foresighting involves identifying key uncertainties (e.g. political positions) and developing scenarios to lead to a better understanding of the forces likely to shape the future (e.g. changing community values), and therefore approaches to support preferred outcomes (e.g. information campaigns) (Alexander, Williams and Trewin 1998). It can be just an outcome (e.g. descriptions of the future), or a process (e.g. to achieve ownership of an outcome by all producers).

An issues paper (Trewin 2000) contained a list of key issues such as whether past supply response are reflective of possible supply responses to major changes. Many of these issues relate to key decisions to be made (e.g. should I maintain investment in the industry?) and the driving forces behind these (e.g. expected relative economic returns and changes in regulations). The list of issues were:

- Basis for assessment – political, scientific and/or economic?
- Will animal welfare be improved – trade-offs of space, cannibalism, etc?
- Will the decision have public support – vocal minority versus dormant majority?
- What community consultations should take place – interest groups or more broadly?
- Will the decision be politically feasible – alternatives commercial or lead to large numbers leaving the industry?
- What will happen to production costs – short and long-term, and what is the economic life of cages?
- What will be the changes in supply – past estimates or survey of intentions?
- What will be the fall in demand – responsiveness given large price changes?
- Will there be an increase in imports – an increasing impact on domestic producers?
- Resultant industry structure – accelerated concentration?
- Do revealed values represent mainly animal welfare values or health, etc?
- Will ‘free range’ remain a premium market – or will retail margins and declining scale effects on distribution costs absorb the premium?
- What is the size of the ‘externalities’ – are the costs of other people’s egg consumption small relative to all cost impacts?
- Will other (developing) countries using conventional cage systems be given a competitive edge?
- Will there be broader impacts on other intensive livestock industries, etc?
- Will processed product growth introduce greater international competition to the Australian market and raise a ‘GMO’-like issue in respect of conventional cage produced eggs?
- Is there a market failure associated with information such as on labelling that requires government involvement?
- What are the costs and benefits of labelling – costs could be large with government bureaucracies involved as they are with meats, and benefits appear small from ACT experience?
- Required data available – free-range production and consumption levels, etc?
- What broad policy options – market correcting or regulatory?

Decisions associated with these issues are undertaken by governments, producers, consumers and so on, especially governments. Associated decisions include:

- Should government ban some forms of production and make labelling compulsory, and what should be the basis for such assessments?
- Should producers undertake new investment, and of what type?
- Should consumers continue to buy eggs rather than alternative products if their choice is constrained and prices have gone up?

There are a number of driving forces underlying these issues such as:

Economic

- increasing demand for more processed foods;
- shifts in the location of trade to developing countries;
- globalisation;

Social

- changing community values;
- underlying demographics (e.g. smaller families)

Political

- trends to smaller government and privatisation;
- weak governments controlled by a number of minority interests;

Technological

- new technologies;
- changing professional positions.

These driving forces can be broken down into basically pre-determined elements (e.g. demographics) and key critical uncertainties (e.g. changing community values). The latter can be used to form 'axes of uncertainty' (e.g. a spectrum along individual and community concerns) that can separate alternative scenarios.

'What if' scenarios can be developed from the above aspects. Usually three or four can be developed to reflect the full spectrum of possibilities. These could be, for example, what could be described as 'Worst nightmare', 'Status quo', and 'Happy days'.

The 'Worst nightmare' scenario could follow the introduction of a ban on conventional cage egg production based on political grounds with little public or other consultation; higher production costs as result of aspects such as more bird deaths, difficulty attracting workers, and on-farm labelling with frequent inspections; a large fall in supply, way beyond past responses; higher retail prices with retail margins being maintained and distribution costs increasing with the smaller scale of production; lower consumption following the higher prices and loss to alternate products as result of aspects such as a constrained choice and food safety problems; import of products from less welfare conscious countries following a failure of trade constraints based on quarantine and 'GMO'-like grounds; many producers leaving because of lower profits; a drop in investment because of increased uncertainty in the industry; accelerated industry concentration; and similar threats being mounted against other intensive industries, etc.

The 'Business as usual' scenario could be based around a continued but gradual tightening of cage requirements following politicians taking into account scientific and economic advice, and public opinion; stable costs as productivity improvements and competition counteract higher new cage standards; supply increasing to meet gradually increasing demand with consumers needs being met in the market; prices following general price trends; consumption growing with population; imports and exports of products steady; industry profits and structure stable; healthy investment in replacement equipment, etc.

The 'Happy days' scenario might be based around a technological development that allows distinctive eggs to be produced out of cages with similar costs, quality, prices, and without animal welfare and worker health negative externalities; general agreement following broad discussions between politicians, producers, consumers, scientists and animal welfare groups that this is the way to go; retail prices fall as a result of greater

competition and lower distribution costs associated with the new eggs; increasing supply and demand, including export growth, as a result of lower prices and health attributes associated with the new eggs; a dynamic industry structure with strong investment in the new technology, etc.

The focus group to which the foresighting could be applied is broad, consisting of all interest groups concerned with the egg sector. Alternatively it could consist of just those directly involved in egg production. A possible comprehensive list is:

- Input suppliers (e.g. AWB)
- Producers (e.g. AEIA)
- Retailers (e.g. Woolies)
- Processors (e.g. McDonalds)
- Consumers (e.g. ACA)
- Animal welfare (e.g. RSPCA)
- Politicians (e.g. ACT Legislative Assembly)
- Scientists (e.g. RIRDC Egg Program Advisory Committee, CSIRO, BRS)
- Government officials (e.g. PC, ABARE, AFFA, QDPI, Local Government planning)
- Other researchers (e.g. relevant RIRDC projects)

Ten to twenty respondents would be required to give representation to all these interest groups. A lesser number would be required if only producer interests were to be covered.

In terms of specifics, respondents would be given information on the issues, driving forces, and the above initial 'seeding' scenarios. Broad responses sought to elicit information for reviewing/refining the scenarios (e.g. estimates of costs and price changes, supply and demand responses, investment, industry structure, etc) would include:

- Are the scenarios plausible, internally consistent, technically accurate, etc? What would you have different in the scenarios? Are all responses/implications /priorities that arise from these possible future scenarios included?
- What are the key decisions, trends of most interest, and potential developments that excite you most?

Other more specific questions asked could include:

- What do you think will be the key determinant of the future scenario facing the industry – politics, science or economics?
- What do you think will be the major sources of eggs/product under the various scenarios? Do you think imports of egg products will be a threat?
- Do you see the scenario played out more through regulation or market forces?
- Could technology save the day? What type of technologies? How should we prepare for these needs?
- What other options to achieve preferred outcomes need to be addressed (e.g. make more information available on egg production systems to the market)?

To producers

- Do you see yourself continuing in production following a ban on conventional cages and what are the main reasons for your decision?

- What investments, if any, would you undertake?

5. Conclusion

This paper considers the economic issues associated with a proposed regulated ban on conventional cage egg production and compulsory labelling of eggs by the method of production. Both the underlying issues, the form of egg production and the labelling of eggs by the method of production, can be addressed to some extent in the market.

The first part of the paper outlines the broad impacts that the above regulations would have and a number of the many issues that such regulations would raise. A key issue is what should be the basis for assessing whether regulation should be imposed or not. Various bases could be chosen, for example scientific assessments and political judgements as have been applied in the past. Scientific assessments of whether overall animal welfare has been improved have been debated, and political judgements are dependent on general public support and their feasibility. It is argued in the paper that an economic approach, which has tended to be secondary in the past, is required. This approach is based on a social cost-benefit analysis framework which incorporates the underlying issue of dynamic social choice between utility from animal production and welfare. Social choice can take into account personal consumption as well externalities such as the impact of the egg consumption of some on others, and loss of freedom of choice. Another key issue is whether the market will supply appropriate information on the methods of production.

Some initial analysis is undertaken of both domestic and international data on revealed market and hypothetical expressed values that consumers are willing to pay for non-conventional cage eggs. The market reveals some consumers are willing to pay a premium for non-conventional cage eggs that they believe incorporate better animal welfare. The market appears to be satisfying these demands as such eggs are currently in excess supply. Analysis of Swiss data, the only country to have banned conventional cage production, shows that there are large costs in such action, both in terms of higher production costs and measures put in place to protect domestic production. Despite this last aspect there are significant leakages of conventional cage production into a depressed Swiss market.

Has society expressed that they would be willing to pay more to have only non-conventional cage eggs produced than the costs involved in such action? Estimates of society's willingness-to-pay for non-conventional cage egg production appear lower than the additional production, adjustment and other costs involved, both in Australia and overseas. Analysis in Sweden shows willingness-to-pay to support a ban is not significantly different from willingness-to-pay for non-conventional cage eggs in the market. Some of these estimates are uncertain but the onus should be on regulators needing to support their case for change rather than the other way around. Moreover, the comparisons have not taken into account all the relevant costs such as the negative externalities that would be induced by a regulated ban taking away consumers' freedom of choice.

Would the costs of labelling eggs by their method of production be justified? Compulsory labelling costs could be high, especially if this is required on-farm. In Australia and elsewhere, animal welfare organisations such as the RSPCA are endorsing eggs produced by specific means for which consumers are willing to pay price premiums that incorporate the costs involved in such an approach. There would appear little need for compulsory labelling and this has had little effect on consumption patterns following its introduction into the ACT. A market-correcting approach, such as the RSPCA implementing stronger property rights, would appear more appealing than regulation in respect of this issue as it was for the choice of egg production system.

The paper has a brief discussion of methods of determining possible future scenarios and their impact on the industry. Such an approach is needed because past estimates of supply responses and so on may not be relevant when large changes are being considered. If supply is more responsive to such changes than current estimates would suggest, and imports of (processed) eggs increase, then producers will face higher costs than expected. Growth in developing country production and in processed products are key features of today's egg industry.

The analysis in the paper is preliminary in a number of respects. It draws on separate pieces of work within the same economic framework in its analysis as no comprehensive studies exist. The results may be preliminary but they do raise sufficient doubts on the economic merits of a regulated ban and compulsory labelling to suggest such actions should be fully investigated before being implemented. Moreover, the issues will not go away and will probably intensify over time. Industry and policy makers need to be aware of what drives such issues and to be prepared for the inevitable changes that will continue to come.

References

Abdalla, A. and G. Rodriguez (2000), 'The economic impacts of banning egg production under battery cage system in Australia', consultancy report to National Offices of AFFA summarised in Layer Hen Housing Conference Report, Gold Coast, 11-12 July.

AFFA (2000), 'Synopsis Report on the Review of Layer Hen Housing and Labelling of Eggs in Australia', <http://www.affa.gov.au/layerhenhousing/henreport/review.html>.

AGM McNair (1994), 'Battery hen survey, Australia', prepared for Animal Liberation Victoria, March.

Alexander, D., B. Williams and R. Trewin (1998), 'Application of foresighting to development options for the future management of, and R&D into, dryland salinity in Australia', LWRRDC Report, LWRRDC, Canberra, May.

Amgarten, M. and D. Meirhans (1992), 'Comparable studies of the economics of different housing systems for laying hens in practice and under the Swiss Poultry Breeding School, Bericht uber die Jahre 1986-1990', Swiss Poultry Breeding School.

Andersson, J. and P. Frykblom (2000), 'Exploring non-market values for the social impact of farm animal welfare legislation', submitted to European Review of Agricultural Economics.

Animals Australia (1998), 'Summary of People Data (Aust) Pty Ltd "Opinion Poll – Battery hens"', December.

ARMCANZ (2000a), 'Media Release – Agricultural Ministers agree on national approaches to rural issues', ARMCANZ, 3 March.

ARMCANZ (2000b), 'Media Release – ARMCANZ2: Layer Hen Housing', ARMCANZ, 18 August.

Bennett, J. W. (1999), 'Some fundamentals of environmental choice modelling', Choice Modelling Research Report No. 11, University of New South Wales, November.

Bennett, R.M. (1995), 'The value of farm animal welfare', *Journal of Agricultural Economics*, 46(1).

Bennett, R. M. (1997a), 'Economics' in M. C. Appleby and B. O. Hughes (eds.), "Animal Welfare", CAB International, Oxford.

Bennett, R. M. (1997b), 'Farm animal welfare and food policy', *Food Policy*, 22(4).

Bennett, R. M. and D. Larson (1996), 'Contingent valuation of the perceived benefits of farm animal welfare legislation: An explanatory survey', *Journal of Agricultural Economics* 47(2).

Frykblom, P. and J. Andersson (2000), 'Measuring the value of farm animal welfare legislation', background paper for poster presented to XXIV International Conference of Agricultural Economists, Berlin, August 12-19, 2000, based on "Exploring non-market values for the social impact of farm animal welfare legislation' submitted to *European Review of Agricultural Economics*.

Larkin, J. T. and Associates (1993), 'The economic impact of revised cage densities on the Australian egg industry: A report for RIRDC', September.

McInerney, J. P. (1991), 'Economic aspects of the animal welfare issue', in Thrusfield, M. V. (ed), "Proceedings of a Meeting of the Society for Veterinary Epidemiology and Preventive Medicine", SVEPM, Edinburgh.

McMaster, H. (2000), 'Australian Egg Industry Association: Annual Statistical Publication 1999', a report for RIRDC, RIRDC 00/158, December.

NFU (1999), 'The future of UK egg production – a survey into the effect of the welfare of laying hens directive on UK egg producers', December.

NFU (2000), 'Capital costs of laying hen directives', NFU Briefing Econ37/00, 8 May.

Oczkowski, E. (1999), 'Modelling the determinants of domestic egg demand', RIRDC Report, Canberra.

Productivity Commission (1998), 'Battery egg sale and production in the ACT', Research Report, AusInfo, Canberra.

RIRDC (2000), 'Benchmarking workshop – Industry strategy development', Proceedings from the workshop held on Wednesday 15 March 2000 at the Novotel Brighton Beach, Sydney, RIRDC Egg Program, March.

Rolfe, J. (1997), 'Estimates of animal welfare using Contingent Valuation and Choice Modelling non-market valuation techniques', paper presented at the "Creating a Green Future" Conference for the Australian New Zealand Society of Ecological Economics, Melbourne, 17-20 November.

Rolfe, J. C. (1999), 'Ethical rules and the demand for free range eggs', *Economic Analysis and Policy* 29(2), 187-206.

Rolfe, J. C., J. W. Bennett and J. Louviere (1997), "Choice Modelling: An Exercise in Environmental Valuation", paper presented to the 41st annual conference of the AARES, Gold Coast, January.

Rolls, E. (1995), 'The Yolk's on Us', The Independent Monthly, August.

SFSO (Swiss Federal Statistical Office)(2000), 'Agriculture and Forestry: Consumption and Production 1998'.

The Economist (1995), 'What humans owe to animals', 19 August.

Trewin, R. (2000), 'Potential and costs of alternative egg production and labelling systems', Issues paper prepared for RIRDC Project ANU-41A Management Committee workshop, ANU, 8 November.

USDA (1997), 'US Egg Production on the Sunny Side in the 1990's', Agricultural Outlook, May.

Figure 1: The Production Possibility Frontier for Perceived Farm Animal Welfare and the Production of Livestock Products

