SOME ECONOMICS OF ANIMAL WELFARE

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1.0 Introduction

Farm animal welfare has developed as an important issue for producers, consumers and legislators. In part it reflects the growing concerns of people about general environmental issues. As society has become more specialised and urbanised, farm production has become more intensive and relatively fewer people are involved. In more recent times, concerns about intensive livestock practices have assumed greater public importance, and legislation has been introduced in many industries to set minimum standards for animal welfare conditions. As well, there has been a steady growth in the number of vegetarians in society because of ethical appeals (e.g. Singer 1973) against eating meat and other animal products, and a growth in the market provision of farm animal friendly products such as free range eggs and dolphin safe tuna.

There has been growing interest from the animal science community about the relationships between animal welfare and production. In general, these are positive, because animals with lower stress levels and better food supplies tend to be more productive. Indeed, the paradox for animal liberation and other environmental groups is that most farm animals owe their existence to demands for food and consumption. However, there are some livestock practices such as those involving battery hens, that do not necessarily impact adversely on production but do have impacts on human welfare.

What humans consider to be adverse welfare impacts will vary between people, across different societies, and change over time. Because these are impacts are difficult to quantify, they have generally only been dealt with through the political process. Special interest groups have lobbied governments and bureaucrats for minimum conditions to be set down in legislation. Perhaps surprisingly, there has been little involvement by economists in assessing the value of farm animal welfare (Bennett 1995), despite the obvious need from decision makers about more information on the social costs of farm animal production. The issues follow the standard textbook example of externalities, where the intensive production of livestock may have some adverse side effects on the feelings of consumers about animal welfare. Some of these side effects can be internalised through the market place, as consumers can register their preferences through their own purchases, or lack of them. Some side effects though are external to market transactions, as when people have preferences about production techniques that produce food for other people. Economics can help to estimate both the total benefits and total costs of production to society, and thus provide advice on efficient production levels. Estimating the value of farm animal welfare will thus be an important step in providing such information.

In this paper, some estimates of farm animal welfare for one particular good, free range eggs, are made. A non-market valuation technique, contingent valuation, has been employed for this purpose. Because demand information about free range eggs is available through market settings, the comparison of the data from preferences stated in the contingent valuation studies to the market data provides some insight into welfare estimates. In particular, it provides an insight into some complexities associated with the estimation of farm animal welfare. Results for several surveys outlined in this paper show how the stated intentions of survey respondents do not correlate very well to market behaviour. There are several possible explanations for these differences, some of which may impact on welfare estimates.

These issues are progressed in the following sections. An overview of the net social benefits of farm animal welfare is presented in section two, followed by a closer look at how preferences for such ethically related goods are formed in section three. An outline of the contingent valuation technique and the results of some surveys follow in sections four and five. In section six the complexities of valuing farm animal welfare are discussed, and section seven concludes the paper.

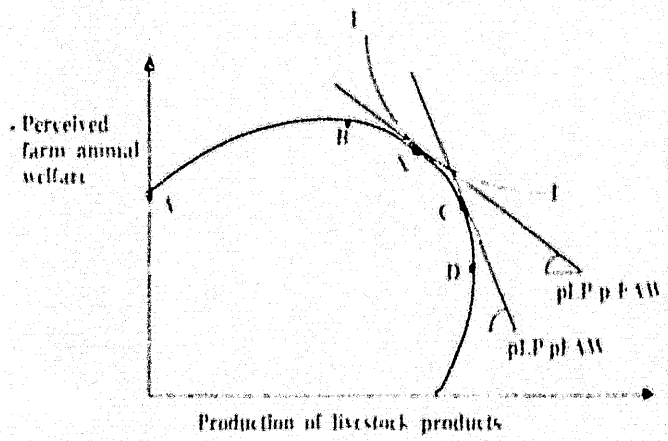
2.0 Farm Animal Welfare and Net Social Benefits

The production of animals and animal products creates both the commercial benefits of food products sold in markets, and more intangible benefits, such as the neat alpine meadows that tourists see in the Alps. One of the side benefits of animal production are the impacts on people about perceived farm animal welfare. There are many examples of production processes that have negative effects on public opinion, including battery hens, cattle feedlots and intensive piggeries. The feeding of animal by-

products to other animals and some animal husbandry proceedures also qualify as negative images for the general public

In Figure one, the relationship between perceived farm animal welfare and the production of is shown As production initially increases (from point A), there is a positive relationship between farm animal welfare (FAW) and production of livestock products (pLP) This reflects the fact that caring for domestic animals and improving their welfare boosts productivity After a certain point though (point B), increased productivity can only be gained by sacrificing animal welfare conditions This tradeoff between productivity and animal welfare continues until the maximum production level of D, at which point there are probably welfare benefits remaining from the animals existence and quality of food, but not much for its way of life Beyond point D, deteriorating animal welfare impacts adversely on productivity (Bennett 1995)

Figure One. The Production Possibility Frontier for Perceived Farm Animal Welfare and the Production of Livestock Products.[1]



The section between B and D represents the area where society must make tradeoffs between increased productivity or increased welfare Any other area on the frontier or inside the frontier represent points where both productivity and increased welfare can be pursued simultaneously For animals that society has very strong welfare feelings about (such as dressage horses) the tradeoff point might lie close to point B For animals that society holds almost no welfare concerns for (oysters) the relevant tradeoff point will lie close to point D The slope of the tangent to the curve indicates the relevant tradeoff between animal welfare and productivity Very flat tangents (as near point B) indicate where large amounts of productivity are needed to compensate small changes in animal welfare Very steep tangents (as near point D), indicate where very large amounts of animal welfare are needed to compensate small changes in productivity

Production points chosen on a frontier do not always reflect socially optimal positions For example, the current production tradeoff for a society might be at point D Such a position might represent the tradeoff between animal welfare and production faced by producers If the concerns of the rest of society could be taken into account, the optimum tradeoff position might lie at point X This represents

[1] Adapted from Bennett 1995

the point of intersection between the possibility frontier and a hypothetical social welfare function which is useful for illustrative purposes (since Arrow 1951). To ensure that production occurred at point X then, society might need to set minimum welfare conditions for farm animals, or to adjust the incentives facing producers.

Economic evaluations are generally facilitated through the use of marginal analysis. For example, production levels are set at efficient levels when the marginal benefits of production are just equal to the marginal costs. For a society on a production possibility frontier, marginal analysis can be employed to estimate the benefits and costs of moving to different positions on the frontier. In the production possibility frontier of Figure 1, benefits and costs can be counted for just two items, production and perceived animal welfare. For example, to move from point B to point C, the increase in production will be a benefit, while the decrease in animal welfare will be a cost. Moving from point C to point X will generate increases in animal welfare as benefits, and decreases in production as costs. In real world examples, there are generally wider ranges of issues that impact on benefits and costs. The task for the economist is to find some mechanism to measure these marginal changes, transfer them to some common scale so that they can be assessed against one another, and then to compare costs and benefits to assess whether a marginal change is worthwhile.

The benefits associated with changes to production are relatively easy to assess because of the information available from preferences revealed in markets. However, the net benefits of other changes are much more difficult to assess because preferences are not revealed in any comprehensive manner. As well, benefits will vary according to the specific change in farm animal welfare and the perceptions and knowledge of people, across people and different societies, and over time as perceptions and tradeoffs change. These difficulties of measuring the benefits of farm animal welfare are similar to those encountered by environmental economists who are estimating the non-use values of environmental assets (Bennett 1995).

3.0 Ethics and Attitudes - Free Range Eggs

People form preferences for environmental goods in complex ways, and it is not easy for social scientists to always model why and how such preferences are formed (Blamey 1996). For example, there are a range of ethical positions that may impact on how an individual might view farm animal welfare. An environmental ethic might depict farm animals as having intrinsic value, and therefore entities to be protected through the establishment of rights or moral duties (Regan 1981, 1983). Such an ethic, focusing on the welfare of the animal as the ultimate source of value, can be termed ecocentric, in contrast to anthropocentric value systems that are based on humans as intrinsic centres of value.

People drawing from an ecocentric value system may choose not to consume any animal products as a consequence of recognising particular moral concerns or animal rights. However, the general thrust of environmental ethics and ecological movements has been to find ways of protecting 'wild' and 'untouched' environmental assets, rather than to focus on human concerns for farm animals (Nash 1989). This is partly because an environmental ethic has to be reasonably holistic. Goals such as ecosystem health and the protection of species tend to matter more than the particular welfare of individual animals (e.g. Callicott 1984, 1989). Problems of welfare of farm animals, which are in no danger of extinction, tend to rate on a very different scale to problems that are seen as impacting on future generations and the sustainability of the planet.

Because of this, concerns for farm animal welfare have generally stemmed from anthropocentric ethical positions. For example, the animal liberation movement appealed to human sentiments by stressing the similarities between animals and humans. Thus Singer (1975) argued that human value systems should be extended to protect sentient animals, and this would provide an ethical basis for vegetarianism. Some philosophers, such as Passmore (1974) argue that concerns for animal welfare can be more simply represented as human responsibilities for nature. Frey (1983) contends that it is not morally inconsistent for an individual to be passively or actively concerned about cruel farming practices and to still eat meat. This means that ethical concerns for farm animal welfare may not only spring from ecocentric positions, but also from a wide range of anthropocentric ethical bases.

This is partly because people draw on a wide range of influences, including ethics and morals, to form their preferences. One of the consequences of forming preferences are feelings of satisfaction (regret) about conforming (defying) with background ethical structures (Broome 1992). In this way ethical frameworks impact on the formation of preferences. The impact will vary across different people according to the ethical structures adopted, time and other factors. For a person sympathising with an ecocentric ethical structure, the positive consequences of being a vegetarian may be very substantial. For others, the impact of a particular ethical structure may be minimal. Thus people may place varying degrees of emphasis on different ethical structures such as those relating to the welfare of their own families, the rights of individual animals, the responsibility of humans towards preserving ecosystems, and their duty of care towards animals.

The actual preferences that are formed may also reflect other influences, such as budget constraints and desires for consumer goods, as well as the desires to conform with the various ethical structures that an individual may hold important. According to circumstances, and over the passage of time, these combinations of influences may change. As well, some of the simplifying decision aids that people use, habits, customs and other 'soft' institutional rules, may change, thus impacting on preference construction.

The purchase of free range eggs illustrates some of these issues. To begin with, it is not unrealistic to expect that ethical positions will impact strongly on demands for free range eggs. For example, Singer (1975) argues specifically against the farming of battery hens on the grounds of animal cruelty. For some people, the purchase decision will conform to strong ethical views, and others (vegans) may not purchase eggs at all because of their ethical beliefs. For many people buying free range eggs though, the tradeoffs between the varying ethical structures and other considerations are not nearly so clear cut, and their decision to purchase may vary according to circumstances. People who only buy 'normal' eggs may not register strong feelings for ethical frameworks involving eggs produced from battery hens.

4.0 Preferences for Free Range Eggs

These issues can be demonstrated with relation to the behaviour of people purchasing free range eggs in Queensland. About 2% of egg sales in Queensland are for free range eggs, with a further 1.7% of sales being for other specialty eggs (such as 'organic' eggs)[2]. The consumption of free range eggs is effectively higher than this proportion though, because of many people, particularly in country areas, producing their own eggs[3]. As well, the proportion of eggs sold that are free range may vary considerably with location, with higher sales often being recorded in more affluent suburbs (Rolls 1995).

In three similar surveys of environmental attitudes conducted in Brisbane in 1995 and 1996 (see Rolfe and Bennett 1996, Rolfe, Bennett and Louviere 1997), 405 respondents were asked about whether they bought or consumed four products on a regular basis. The products nominated were phosphate free laundry detergent, unbleached toilet paper, free range eggs and 'dolphin safe' tuna. The results are indicated below in Diagram two, where it shows that 48% of the respondents said that they purchased or consumed free range eggs. On average, 51% of respondents claimed to be buying or consuming one of the environmental friendly goods involved on a regular basis.

A following question in the same surveys asked respondents to choose between two shopping baskets of goods, one containing normal consumer items, and the other basket containing the environmental friendly equivalents. The goods involved were the same ones reported in Diagram 2 below, with the addition of an *ordinary shampoo*, versus a *shampoo untested on animals*. The price difference of the baskets was indicated at $3.00 per shopping, or $150 over one year of purchases, and survey respondents were asked to show their preference for the different baskets of goods. 68% of respondents (274 from a total of 402) indicated that they would choose the environmental friendly basket of goods.

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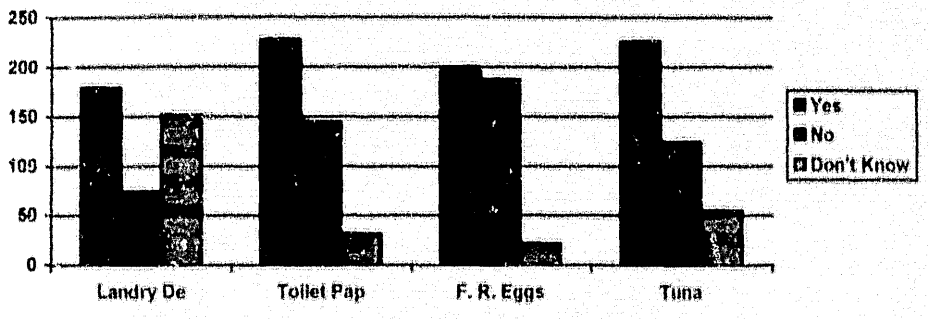
[2] Information supplied by the Queensland Egg Marketing Board.

[3] Rolls (1995) reports that, Australia wide, about 16% of eggs are laid in back yards for home consumption.

Diagram 2. Purchase or Consumption of Environmental Friendly Goods on a Regular Basis



These surveys revealed a major discrepancy between the preferences reported by people for environmental friendly goods, their self-assessed buying and consumption patterns, and the overall pattern of purchases for one particular good involved, free range eggs. In the surveys, 48% of respondents indicated that they regularly purchased free range eggs. 68% of the same respondents indicated that they would prefer to buy baskets of environmental friendly goods that included free range eggs, yet a maximum of approximately 20% of eggs produced in Queensland are free range[4]

Apart from these discrepancies between preferences and behaviour, the demand for free range eggs offers another issue of relevance to environmental economics. It is possible that people hold concerns for battery hens and the way in which eggs are produced, yet do not reflect those concerns by purchasing free range eggs on a regular basis. They indicate (as in the above survey) that their preference would be to purchase more free range eggs, (and they say that they buy them more regularly than the market data would suggest). One possible reason for this discrepancy between preferences and market behaviour lies in the analysis of the goods that are being valued.

A consumer purchasing free range eggs may do so on the basis of several attributes. Beliefs about superior nutritional values, the absence of chemical traces, concerns about the welfare of battery hens, and desires to support smaller, alternate, egg producers are just some of the possible factors involved. Hence, welfare concerns for battery hens are not necessarily a major influence. The purchase of free range eggs by one customer has little effect on the welfare of battery hens. That welfare is dictated by demands from people who purchase 'normal' eggs. The actions of one consumer withdrawing their demands for 'normal' eggs will not impact very significantly on the market. Welfare concerns therefore may relate more to the impacts of other peoples' consumption of 'normal' eggs than on the impact of the individual's consumption. The issue is a classic example of an externality, where the choice of some consumers for eggs produced from battery hens has impacts on the welfare of other people.

Concerns about farm animal welfare issues may be addressed by public sector actions, such as the introduction of regulation to set certain standards. In this case, the spill-over effects (concerns about the welfare of battery hens) created by the actions of others can be reduced by regulations that set minimum conditions, or removed by regulations that bans the keeping of battery hens[5]. The improvement in welfare that might result from improving conditions and reducing concerns about the welfare of battery hens will be offset by increases in egg prices. To some extent, the current situation in Queensland reflects one choice about where the tradeoff should lie between increased production costs and the welfare of battery hens.

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[4] This is made up of 3.7% of retail egg sales for free range and other specialty eggs, and another 6% of eggs that are produced by households for their own consumption (effectively under free range conditions).

[5] Australia, as in many other countries, has minimum condition regulations for the keeping of battery hens. Switzerland is the only country that has banned battery cages.

The production costs involved in moving to a different position, one where battery hens were banned, can be estimated from the price premium paid for free range eggs. A premium of between $1 to $1.50 per carton is generally attached to the retail of free range eggs. To justify the banning of battery hens, and the tradeoff against the subsequent rise in egg prices, the welfare gains would need to be at least $1 per carton for eggs that were formally produced by battery hens.

It is possible that the demands for free range eggs supplied in markets provide little indication of the social welfare benefits that might result from a banning of battery hen production. People may hold substantial values for the non-production of eggs in intensive production situations, but not bother to express those values in market settings because of the negligible impact that their choices would register. Conversely, preferences expressed through the political process or for regulatory approaches may be quite different from preferences expressed in markets because the implication of a regulatory approach is that regulations curtail the actions of everybody. Thus a proposal to ban the farming of battery hens may attract support because it would set the standards for everybody in society. The implication of the political process is that attracting more than 50% support is enough to ensure change.

The different responses according to whether a market setting or a political process are modelled have implications for practitioners of environmental valuation techniques. For example, resource economists employing the contingent valuation technique often use referendum models to assess preferences (the dichotomous choice format), as well as market based models (the open ended format). Indeed, the dichotomous choice format is usually viewed as the more appropriate technique (NOAA Panel 1993, Portney 1994). Showing that survey respondents effectively are valuing different goods according to which approach is taken has implications for the use of contingent valuation techniques.

This particular hypothesis, that preferences for free range eggs will vary according to institutional setting, may be tested by measuring whether the willingness to pay (WTP) measures (through the use of higher egg prices) differed between the current market choices and a hypothetical situation where the keeping of battery hens was banned. The results of a survey reported in the following section was designed to model more closely the demands for free range eggs.

5.0 The Contingent Valuation Survey

There are two broad choices of technique for estimating values of farm animal welfare. The first is to rely on preferences revealed in markets, using a technique such as hedonic pricing. The second is to rely on stated preferences that people have for an environmental change in response to some survey technique such as contingent valuation (CV). Both approaches will provide information about the farm animal welfare benefits attached to free range egg production. For example, a hedonic price analysis of free range eggs would estimate the implicit prices paid for particular characteristics of eggs, such as taste, and yolk colour, as well as for the characterisic of interest, the perceived better welfare of hens. However, it is unlikely that the price premium for free range eggs will relate entirely to the welfare of hens, as it may also reflect perceptions about characteristics such as food safety, nutritional value and the welfare of egg producers. This means that the estimation of price premiums for characteristics may be a complex task, and based on a poor data set if some attributes do not vary across 'different' eggs.

As well, hedonic pricing, in common with other revealed preference techniques, is limited to measuring direct use values. The hypothesis to be tested in this case involves non-use values as significant components of welfare, specifically the preferences of consumers and non-consumers about other peoples' consumption of eggs from battery hens. Contingent valuation is a stated preference technique available that is able to capture both use and non-use values, and thus is a more inclusive valuing technique. As well, it is essentially forward looking in that it can capture the future intentions of people, while revealed preference techniques are restricted to ex-post market transactions. For these reasons, CV has been chosen as an appropriate valuation technique for this survey.

CV was first introduced by Davis (1964), and has since been developed and widely applied in the area of environmental valuation (Mitchell and Carson 1989, Carson et al 1995). The technique uses hypothetical markets to draw out the behavioural intentions of people. Survey instruments assess the preferences that people hold for a particular good of interest, and enable the researcher to estimate in monetary terms how survey respondents trade-off private consumption for the good in question. These

results can then be used as estimates of consumer surplus, or to provide 'missing values' in applications of Benefit-Cost Analysis

The CV method comprises of four essential stages First, the change in the proposed good in question needs to be described to survey respondents so that they have an accurate idea of what they are being asked to value and of the surrounding circumstances Second, the payment mode (such as an increase in taxes) needs to be outlined Third respondents are reminded of substitutes and income constraints Fourth, respondents are asked for their willingness to pay for a proposed change The open ended format allows them to express their estimates directly In the dichotomous choice format, respondents are asked to vote yes or no about whether they would accept a particular tradeoff By varying the tradeoff amount to different (random) groups of respondents, the researcher is then able to estimate a WTP function, and hence a median WTP bid

There are generally three other components to a CV survey First, a survey often begins with more general questions introducing the good in question that allow respondents time to frame their responses and construct their preferences Second, there are generally some attitudinal questions that provide an albeit weak check on responses, and provide some basis for assessing the validity of the unusual or outlier responses that may occur Third, demographic data is recorded, so that respondent characteristics are available for inclusion into explanatory models

There has been some criticism of the CV method and its results (Bennett and Carter 1993) The main difficulties with the application of the method relate to its hypothetical nature and potential for various biases in its application (Mitchell and Carson 1989) Recent evaluations have concluded that the method can be reliably used for estimating economic values if appropriate techniques and guidelines are used (NOAA 1993, Portney 1994)

Survey design and choice framing is a complex task because of the need to accurately define the good in question to all respondents Some tradeoffs are not familiar to respondents, while others can become embedded in wider issues, or entangled in ethical and moral issues For complex or little known goods, the amount of information that is introduced can produce additional biases, effectively delineating the limits to the contingent valuation method (Rolfe 1996) Thus an important prerequisite to survey design are attempts to understand the level of peoples' attitudes and knowledge about the good in question and how they are likely to construct their preferences for the tradeoffs to be presented

5.1 Application of the Survey

The CV survey reported below was performed in Rockhampton in Central Queensland in mid-December, 1996 A drop-off/pick-up collection method was adopted where the data collectors selected a random sample of houses, introduced themselves and details of the survey to respondents, left the survey for completion, and subsequently returned to collect it 105 forms were completed for the survey

The survey adopted an open-ended format because of the familiarity of respondents with the item in question (free range eggs) and the payment mechanism (price premiums for free range eggs) The good to be valued in this case, the benefits of banning egg production from battery hens, was relatively easy to define After a number of introductory questions, including questions on the purchase and reasons for buying free range eggs, survey respondents were asked to indicate

the maximum extra amount that you would be prepared to pay per carton of eggs to ensure that battery hens were banned.

The subsequent question asked them to indicate the number of cartons of eggs that they consumed per month, so that estimates of their willingness to pay per month and per year could be made

The familiarity of respondents with free range eggs as a consumer good is likely to have minimised the impact of potential biases on results Embedding effects (Kahneman and Knetsch 1992) and part-whole bias (Mitchell and Carson 1989) relate to problems of scope (Carson and Mitchell 1993), where respondents are held to value more inclusive goods than the one in question. The effects of the bias

would be that changing the scope or size of the environmental commodity would induce little change in the WTP responses. Payment vehicle bias relates to the potential for distorted application and responses to various payment options, such as increases in specific taxes. Consumers though are familiar with the decision to purchase free range eggs and the associated price premiums, as well as with the variable nature of prices. Little problem was anticipated with biases relating to scope or payment vehicle.

Hypothetical bias is a potential problem for the application of CV where respondents do not find scenarios plausible, and hence do not provide accurate answers (Wilks 1990). The possibility of hypothetical bias in this survey was addressed in the short preamble to the WTP question, which stated that while minimum conditions for the keeping of battery hens was set down by legislation, there was still opposition to the practice from animal welfare and other concerned environmental groups. As well, it was pointed out that

> *a ban on battery hens would mean that all eggs would be produced on a free range basis, and thus be a little bit more expensive*

Because many eggs are already produced on a free range basis, it is unlikely that that the scenario of banning battery egg production would be considered unduly hypothetical. For similar reasons, and the presentation of minimal extra information, potential problems of information bias, where the information presented influences WTP bids, were also considered to be low.

Strategic bias refers to the possibility that respondents may try to influence survey outcomes by deliberately mis-representing their WTP amounts (Mitchell and Carson 1989). This potential bias arises because of the hypothetical nature of the CV survey and the fact that the WTP bids are not actually collected. While there is little evidence that strategic bias is a major issue in CV surveys (Morrison et al 1997), it should be noted for this survey that the scenario was not only plausible, but possible. It would be feasible to introduce a ban on the keeping battery hens, and for this reason, the possibility of strategic bias is not considered to be high.

5.2 The Survey Results

There were several sections to the survey. After some introductory questions on general environmental issues (which acted as warm-up questions for making choices between options, and as reminders of substitute goods), respondents were asked about their purchasing and consumption patterns of the same four consumer goods used in the surveys run in Brisbane. The responses for these goods (phosphate free laundry detergent, unbleached toilet paper, free range eggs and 'dolphin safe' tuna) are outlined in Table 1 in terms of proportion of response.

Table 1. Purchase or Consumption of Particular Goods

	Always	Most Times	Sometimes	Very Occasionally	Never
Phosphate free laundry detergent	19	13	35	10	23
Unbleached toilet paper	15	9	26	13	37
Free range eggs	12	14	26	15	33
'Dolphin safe' tuna	47	15	11	4	23

These responses confirm and explain the results from the Brisbane surveys, showing that the 'regular' purchase or consumption of environmental friendly goods approximately matches the 'always', 'most times, and 'sometimes' categories of this survey. For example, the 48% 'yes' response for free range eggs in the Brisbane survey compares to a 52% response across those three categories in this survey. Similar results were generated from the next section of the survey which asked respondents to indicate the proportion of eggs consumed that were free range.

Respondents were then asked to indicate their main reasons for purchasing free range eggs. 40% of respondents indicated that the main reason for purchase was because they believed the eggs were more

natural and healthier than other eggs. 20% nominated an unwillingness to purchase battery hen eggs as the main reason, while 16% nominated free range eggs as better for the environment, 14% held that free range eggs were more nutritional, and 12% wished to support alternate egg producers. The nutritional and natural/healthy categories account for more than 50% of demand, indicating that health considerations were the primary reasons for consuming free range eggs.

The concept of referendum questions were explicitly introduced with a series of questions asking respondents how they would vote for particular proposals. Respondents were told that more than 50% support would be needed to pass a change, and that disadvantaged primary producers would be compensated in each case. The responses (in terms of percentages) are shown in Table 2.

Table 2. Potential Support for Bans on Agricultural Production Techniques

	In Favour	Not in Favour	Undecided
A ban on the use of chemicals in the production of vegetables	69	11	20
A ban on intensive poultry production	60	17	23
A ban on intensive piggeries	54	15	31
A ban on the development of genetically engineered fruits and vegetables	50	25	25
A ban on cattle feedlots	35	34	31

The WTP question followed after this section. After checking the outher results, some responses were removed that were inconsistent with the earlier responses on consumption of free range eggs and the possible ban on intensive poultry production. These respondents may have indicated their WTP for a carton of eggs, rather than their WTP for an additional premium. The frequency distribution of the results are indicated in Table 3 below.

Table 3. WTP premium for battery hens to be banned x Frequency

WTP amount ($)	Number of bids
0	22
0.1	4
0.2	7
0.3	2
0.5	20
0.7	1
0.8	1
1	34
1.5	5
2	1
3.5	1
4	2
Grand Total	100

The results showed strong support patterns for $0.00, $0.50 and $1.00 bid levels. The median bid amount was $0.50, while the mean bid amount was $0.69 with a standard deviation of $0.72. The WTP amounts were multiplied by the number of cartons of eggs purchased each month (2.72 average) that respondents indicated in the following question, and this amount was then multiplied by 12 to arrive at the total WTP per annum. The frequency distribution of those results are indicated in Table 4 below.

Table 4. WTP per annum x Frequency

WTP amount ($)	Number of bids
0	22
2 4	1
3	1
3 6	1
4 8	5
6	3
7 2	1
9 6	2
12	14
12 6	1
16 8	1
18	9
19 2	1
21	1
24	14
30	1
36	6
42	1
45	1
48	5
54	1
60	2
72	2
96	1
120	1
192	1
240	1
Grand Total	100

The median annual WTP is $12, while the mean WTP is $22 61 with a standard deviation of $34 71

6.0 Some Implications of the Survey Results

The WTP estimates of the survey demonstrate that the value of improving the welfare of hens by banning battery hen production is substantial The median estimates are that consumers are willing to pay $0 50 per carton, or $12 00 per year to know that battery hen production would be banned

However, the distribution of WTP bids helps to demonstrate both the low demands for free range eggs, and the tradeoffs involved in banning battery hens 91% of the WTP bids (Table 3) are below $1 50, and 57% of the bids lie below $1 00 Given that the premiums for free range eggs generally lie between $1 00 and $1 50, these median results show that the extra costs involved in producing free range eggs are unlikely to be compensated by the social benefits arising from banning the production of eggs from battery hens

However, the depth of support for banning battery hens (78% in Table 4), and banning intensive poultry production (60% in Table 2) suggests that the majority of the population will enjoy some of the welfare benefits associated with a change in behaviour

These results suffer from a difficulty in that survey respondents indicated a variety of reasons for purchasing and consuming free range eggs. While concerns for battery hens were significant, the overwhelming reason for support appeared to be concerns for food safety/quality. The WTP estimates generated in this survey do not relate solely to considerations of farm animal welfare. Therefore, some method is needed to disaggregate support for banning battery egg production into the various components. Choice modelling may be a suitable technique for this purpose[6].

The distribution of WTP bids also helps to explain the variations reported above between the stated intentions of respondents and their likely market behaviour. 78% of respondents in the CV exercise indicated that they would receive some benefit from a ban on battery hens. This compares favourably with the 68% of respondents in earlier surveys who indicated that they would prefer to buy baskets of environmentally friendly goods that included free range eggs.

However, in the WTP bids above, only 9% of respondents indicated preferences for price premiums over $1.00 that presumably could be satisfied by the market supply of free range eggs. For the bulk of respondents, the benefits of a ban on battery hens are not substantial enough to match the increased costs of production, explaining why actual consumption of free range eggs is low.

Little support can be deduced for the hypothesis that support for a ban on battery hens will vary according to institutional setting. While the proportion of respondents who indicated they would support above-market premiums for eggs if battery hens was banned was higher (9%) than current purchases of free range eggs in Queensland (2%), the issue is clouded by evidence that many people buy free range eggs on an intermittent basis, and that there is a substantial private production of eggs that can be classified as free range. Subsequent applications of this survey need to include questions on the private production of eggs to help separate out these factors.

As well, the survey format used, an open-ended elicitation format, was slightly incongruous with the hypothesis being tested, which was that the preferences of people would be different in a referendum style format. A more appropriate survey format might be one that presented people with specific tradeoffs, and asked them to indicate their preference. Thus the hypothesis may be better tested in a dichotomous choice CV format, or through an application of a choice modelling exercise (see Morrison et al 1997).

7.0 Conclusion

In this paper a general economic framework for assessing issues of farm animal welfare has been outlined. These issues generally arise as externalities, where the production of farm animals generates not only food products for consumers, but may also generate welfare losses people concerned with animal welfare issues. In keeping with standard marginalise analysis, a change in production standards can be supported if the resulting gains (increases in welfare from knowing that animals are kept in better conditions) outweigh the losses (reduction in productivity). In many cases, improved conditions for animals lead to increases in productivity, and there is only a subset of production conditions where a tradeoff may occur between farm animal welfare and productivity.

This general framework has been demonstrated with reference to demands for free range eggs in Queensland. A contingent valuation survey indicated that the median willingness to pay of people for a price premium for eggs as a result of a ban on battery hens was $0.50. Given that the extra production costs of producing free range eggs are between $1.00 and $1.50, it appears that the increases in welfare resulting from a ban on battery hens (although substantial and accruing to nearly three quarters of the population), are not significant enough to outweigh the resulting increases in costs of production (and hence welfare losses). Care should be taken in interpreting the results, because they do not consider the marginal effects associated with more moderate changes in the welfare of battery hens.

[6] Ness and Gerhardy (1994) provide an example of a conjoint analysis approach that disaggregates the impact of various attributes of eggs on demand.

The results are complicated by several issues. First, it appears that concerns about the welfare of battery hens are not the only reason why consumers purchase free range eggs. Perceptions about improved food quality and safety issues are more significant reasons for purchase. The CV survey reported was unable to disaggregate the willingness to pay bids according to different motivations for support, and therefore the results do not estimate welfare changes accruing solely from considerations of farm animal welfare. Other stated preference techniques, such as choice modelling, may be appropriate for this task.

Second, results from the various surveys reported here show how the intentions of people change according to whether they are expressing their intentions to purchase free range eggs in the future, self-reporting their past purchasing and consumption behaviour, or revealing their preferences in actual market transactions. The results of this survey show that the proportions of respondents who revealed some welfare benefits of a ban on battery hens (78%) was roughly comparable to the proportion who indicated that they would choose to buy select baskets of environmentally friendly goods (68%).

However, the proportion of free range and other specialty eggs purchased in the market or produced for home consumption is much lower, perhaps around 20% of total egg consumption. Variations in the scope involved in the different exercises helps to explain the variations between stated preferences and the preferences revealed in market [illegible].

Third, it was hypothesised before the survey that support for a ban on battery hens may change according to institutional setting. People may support a vote to ban battery hens because a successful result would mean that all consumers would be restricted to free range eggs. In contrast, the refusal to purchase 'normal' eggs in a market setting will not influence the demands of other consumers, and hence have little effect on the welfare of battery hens.

The results from this survey were not strong enough to support the hypothesis. While 78% of the respondents indicated some willingness to pay a price premium to ensure a ban on battery hens was effected, only 9% of respondents gave bid amounts of $1.50 or larger. This is unlikely to be a larger proportion of the population than that who currently purchase or consume free range eggs. However, the survey technique used, an open ended elicitation format, was slightly incongruent with the hypothesis being tested, which was that results would be different in a referendum style format. The use of a dichotomous choice format may have generated more realistic scenarios, and hence different results.

Finally, survey respondents were asked to indicate how they would vote for possible referendums that banned certain agricultural practices, such as intensive livestock production and the use of chemicals in the production of vegetables. Lower support was registered for a ban on intensive piggeries and cattle feedlots than for a ban on intensive poultry productions. The results, while of limited significance, provide an indication that concerns about farm animal welfare are not extreme for both the production of pork and beef.

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