

COMPASSION IN WORLD FARMING TRUST

FACTORY FARMING AND THE MYTH OF CHEAP FOOD

**THE ECONOMIC IMPLICATIONS OF
INTENSIVE ANIMAL HUSBANDRY SYSTEMS**

**A Compassion in World Farming Trust report
by
Peter Stevenson**

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Compassion in World Farming Trust
5a Charles Street, Petersfield, Hampshire, GU32 3EH. UK
Tel. +44 (0)1730 268070 Fax. +44 (0)1730 260791
Email: compassion@ciwf.co.uk
Website: www.ciwf.co.uk

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FACTORY FARMING AND THE MYTH OF CHEAP FOOD

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1.0 INTRODUCTION

It would be helpful if at the outset we attempted to indicate what we mean by ‘intensive animal husbandry’ or ‘factory farming’.

Such systems are characterised by an approach whereby producers’ dominant concern is to maximise the yield from the animals concerned, with little attention being given to the impact of the production system on the animals’ health and welfare. The animals are regarded simply as units of production to be used as efficiently as possible rather than as sentient beings capable of suffering when pain or ill-health is imposed on them, or when their behavioural or social needs are denied.

In intensive systems animals are typically kept indoors for the whole of their lives crammed into barren, overcrowded sheds or cages or, in the case of sows, isolated for weeks at a time in stalls so narrow that they cannot even turn round. Through a combination of selective breeding, rich diets and growth-promoting antibiotics the animals are pushed to ever higher yields, which all too often are accompanied by ill-health and poor welfare.

Intensive systems invariably include one or more of the following elements:

- a) serious health problems or physical pain are imposed on the animals;
- b) the animals are prevented from performing much of their natural behaviour. Systems which prevent pigs from rooting or hens from spreading their wings must be condemned as unacceptable;
- c) the animals are prevented from engaging in the social behaviour which is natural to their species.

There is by now widespread agreement - in the scientific literature, by politicians and amongst the public at large - that intensive husbandry has serious adverse welfare implications for the animals involved. “But”, one hears it said, “it has given us cheap food”.

The purpose of this report is to examine this contention - that factory farming has given us cheap food - as we do not believe that any serious scrutiny bears this out.

There is a widespread assumption that a move away from factory farming inevitably involves a significant increase in production costs (i.e. items such as labour, feed and capital). In fact this assumption often proves to be incorrect. In some cases the production costs involved in rearing animals humanely are only slightly higher than - or broadly on a par with - those incurred in intensive systems. Thus - as will be seen below - the production costs of a free-range egg are just over one pence higher than those of a battery egg. Turning to pigs, the costs of outdoor breeding and rearing often compare favourably with indoor production.

It is, however, not just a question of production costs. Factory farming involves high 'hidden' costs such as:

- a) pollution and other damage to the environment;
- b) reduced food safety and a higher incidence of food poisoning and other foodborne diseases; and
- c) the clean-up costs of dealing with major crises such as salmonella and BSE.

These costs are hidden in the sense that they are not included when the retail price of food is calculated. We pay for them nonetheless either in terms of an impoverished environment or as taxpayers compelled to fund the costs of dealing with pollution and BSE and the added burden placed on the National Health Service by the rising level of food poisoning.

These hidden costs are sometimes referred to as "negative externalities". They are 'external' in the sense that they are not included in the market price of the food in question, but from an economics viewpoint they must be included in any true computation of the overall cost of factory farming.

The final hidden cost is the huge amount of suffering imposed on animals by intensive farming. Unlike pollution and foodborne disease which can - often with great difficulty - be costed, animal suffering does not lend itself to being evaluated in monetary terms (although economists such as Bennett (1996(b)) have sought to measure how much people are willing to pay for improved animal welfare, for example their willingness to pay - through increases in egg prices - for a ban on the battery cage).

The fact that animal suffering cannot be measured in money terms does not mean that it can be ignored when we examine the costs of intensive husbandry. As a civilised society we subscribe to certain values - such as the compassionate treatment of animals - even where they cannot be given a market value and indeed even when they run counter to our economic self-interest. It is in the nature of values and principles that sometimes they impose a cost on us.

Put simply, we should not ignore animal suffering simply because it is difficult to put a price on it. Indeed Rawles (1997) has challenged the notion that all our human values can be reduced to our role as consumers; rather we are also citizens who have many values - such as the decent treatment of animals - which are not reducible to money.

As humans we have chosen to take farm animals under our jurisdiction and thus have a responsibility for ensuring that they are not treated in ways which jeopardise their health and welfare. They should be treated not as cheap, renewable resources but as living creatures capable of suffering but able also - if we let them - to enjoy a state of well-being.

2.0 PRODUCTION COSTS

The advocates of intensive farming often assert that keeping animals free-range involves very much higher production costs than intensive indoor husbandry. Careful examination of the economic data, however, reveals that this is not the case. Free-range eggs, for example, involve only slightly greater production costs than battery eggs. There is, moreover, no significant difference between the costs of keeping breeding sows indoors and those of keeping them outdoors. Turning to veal, the European Commission has concluded that abandoning the veal crate system “would have a negligible effect on the costs of calf rearing”. They stated that changing from individual pens to group housing would lead to an increase in costs of about 1.1% (Commission, 1996).

It should be stressed that the relatively small price increases involved in changing from intensive farming to free-range come at a time when our food is costing us less - both as a proportion of overall expenditure and in relation to average price levels - than ever before.

In 1940, the average proportion of income spent on household food was just over 30%. In the period 1984-86, 14.1% of total consumers' expenditure was on household food, whereas by 1995 this figure

had fallen to 10.9% (MAFF, 1995a). Moreover, food prices have been rising at a much lower rate than prices in general. Thus in 1984-86 the retail price index (1990 = 100) for all items was 74.4, with food - at 79.6 - being more expensive than the average item. By 1996, however, food - at 118.5 - had become *less* expensive than the average item which cost 121.1 (MAFF, 1996a).

At a time when our food has become much cheaper in real terms than ever before, it could be argued that as a society we could afford to pay the relatively small extra sums needed to ensure that animals are reared in good conditions.

3.0 EGGS

The fear is often expressed that if the use of the battery cage was brought to an end, the price of eggs would be bound to rise dramatically. Research reveals this assumption to be incorrect. As will be seen below, if the cage was abandoned, the cost of producing eggs would rise by 8% - 45% depending on which alternative system was used and on which survey of production costs was being referred to (Roberts and Farrar, 1993; Van Horne, 1996; SVC, 1996).

The average household consumes around 9 eggs per week (Bennett, 1997); as will be shown, average household expenditure on eggs would rise by just 7.3 – 12.2 pence per week if the use of the battery cage was ended. As will be seen, the average person's weekly expenditure on eggs would rise by just 1.5 – 2.6 pence if the use of the battery cage was brought to an end provided, of course, that retailers charged no more extra for barn eggs or free-range eggs than was justified by their slightly higher production costs.

3.1 Surveys of egg production costs

In 1996 the European Commission's Scientific Veterinary Committee (SVC) produced a comprehensive review of egg production in the European Union (SVC, 1996). The SVC examined a number of studies which compared egg production costs in a wide range of husbandry systems.

The SVC concluded that, as compared with the battery cage, housing hens in aviary/perchery systems increased production costs by 8 - 15%, housing on deep litter increased production costs by about 18% and keeping hens in outdoor systems increased such costs by up to about 50%. The NFU (1997),

however, reported a much lower figure for free-range; their figures indicate that keeping hens free-range increases production costs by 33.7%. The SVC produced the following table to summarise the various studies examined by them:

TABLE 1

SVC SUMMARY OF EGG PRODUCTION COSTS IN DIFFERENT SYSTEMS

Data produced by European Commission's Scientific Veterinary Committee, 1996

System	Stocking Density	Cost
Cage	450 cm ² /bird	100
Cage	600 cm ² /bird	105
Cage	800 cm ² /bird	110
Aviary/Perchery	20 birds/m ²	110
Aviary/Perchery	12 birds/m ²	115
Deep Litter	7 birds/m ²	120
Free-Range	1000 birds/hectare	140

Note: The cost figures are given on the basis that production costs in a cage stocked at 450 cm²/bird form the base cost of 100, against which costs in other systems can be compared.

Roberts and Farrar (1993) conducted a major costing survey of the egg industry; their survey covered 17% of the total English laying flock; some of their principal findings are shown in section A of Tables 2-4. They found that the total production costs for battery hens amount to £10.10 per bird per year. For free-range hens the total costs per bird per year are £12.80, a figure £2.70 greater than the battery hen costs.

Roberts and Farrar (1993) found that the average annual yield in 1992 per free-range hen was 254 eggs. With total production costs per year per free-range hen amounting to £12.80, this means that each free-range egg costs 5.04 pence to produce.

Turning to the battery system, Roberts and Farrar (1993) found that the average annual yield in 1992 per battery hen was 278 eggs. With total production costs per year per battery hen amounting to £10.10, this means that each battery egg costs 3.63 pence to produce.

In short, a free-range egg costs only 1.41 pence more to produce than a battery egg.

The average consumption of eggs per person per week in the UK is 1.85 (MAFF, 1995a). As a free-range egg costs only 1.41 pence more to produce than a battery egg, consumers could change from battery to free-range eggs at a cost of just 2.61 pence per person per week (provided, as indicated earlier, that retailers do not charge premium prices for free-range eggs).

TABLE 2

**COMPARISON OF PRODUCTION COSTS AS BETWEEN
DIFFERENT EGG PRODUCTION SYSTEMS**

A: As per survey by Roberts and Farrar, 1993

	Battery	Free-range	Perchery
Total costs per bird per year	£10.10	£12.80	£11.57
Egg yield per bird per year	278	254	255
Cost of producing one egg	3.63 pence	5.04 pence	4.54 pence

B: As per NFU, 1997

	Battery	Free-range	Perchery
Total costs per bird per year	£11.58	£14.75	£13.21
Egg yield per bird per year	279	266	271
Cost of producing one egg	4.16 pence	5.56 pence	4.88 pence

Note: NFU, 1997 gives total costs and egg yield for a 55-week laying period; the author has converted these figures into per annum figures.

The costs of producing barn eggs were also examined by Roberts and Farrar (1993). (Barn eggs come from hens kept in percheries or aviaries. In these systems hens are kept on a colony basis in housing which includes raised perches or platforms. A littered area of floor is also usually provided.) Roberts and Farrar found that the total production costs for hens producing barn eggs ('barn hen') amount to

£11.57 per bird per year (the like figure for battery hens being £10.10). Thus the annual production costs for a barn hen are just £1.47 greater than for a battery hen.

The average yield per year for a barn hen in 1992 was 255 eggs (Roberts and Farrar, 1993). With total production costs per year per barn hen amounting to £11.57, each barn egg costs 4.54 pence to produce, making a barn egg just 0.91 pence more expensive to produce than a battery egg.

On the basis that on average each person consumes 1.85 eggs per week, consumers could change from battery to barn eggs at a cost of just 1.68 pence per person per week.

In percentage terms Roberts and Farrar's figures show that production costs for barn eggs are 25% higher than for battery eggs. A more recent study by Van Horne (1996) reports a much lower differential for production costs as between aviaries and cages. Van Horne carried out a large scale survey in the Netherlands of aviaries and cages. He found that production costs in aviaries were only 8.2% higher than in battery cages. (Aviaries - which are broadly similar to percheries - involve housing hens indoors on a number of platforms installed at different levels.)

From the above, it is clear that changing from battery eggs to eggs from hens reared in more humane conditions need involve only a very small increase in consumer expenditure on food.

Recent data - see section B of Tables 2-4 and Table 6 - produced by the NFU shows a similar pattern (NFU, 1997). The NFU found that total production costs per annum for a battery hen come to £11.58 per bird. For free-range hens, total costs per bird per year are £14.75, i.e. £3.17 more than for battery hens.

The NFU data shows that it costs 1.4 pence more to produce a free-range rather than a battery egg. With average egg consumption running at 1.85 eggs per person per week, consumers could - on the basis of the NFU figures - change from battery to free-range eggs at a cost of 2.59 pence per person per week. (At a later point this report averages out the key costs as shown by the NFU, Roberts and Farrar and a third set of data).

Turning to barn eggs, NFU (1997) shows that total production costs for a barn hen come to £13.21 per bird per year; this is £1.63 greater than for a battery hen. As the NFU figures show that a barn egg

costs 0.72 pence more to produce than a battery egg, the cost per person per week of changing from battery to barn eggs would be 1.33 pence.

In conclusion, the NFU figures are in accordance with Roberts and Farrar's in indicating that there is only a very small difference in production costs as between battery eggs on the one hand and barn and free-range eggs on the other.

3.2 Labour costs in egg production

Advocates of factory farming often argue that free-range and other extensive systems require very much more labour than intensive systems. In the case of poultry, it is correct that percheries and free-range systems require more labour than battery cage systems. However, the amount of extra labour required and its impact on overall production costs is often severely exaggerated.

Table 3 shows that Roberts and Farrar found that, on average, labour costs represent only 13.9% of total egg production costs. Table 3 also shows that - based on Roberts and Farrar's figures - the extra labour cost involved in producing half a dozen free-range eggs rather than battery eggs is just 2.88 pence. Similarly, the extra labour cost involved in producing half a dozen barn eggs rather than battery eggs is just 1.56 pence.

Figures produced by NFU (1997) show that, on average, labour costs represent just 13.2% of overall egg production costs (see section B of Table 3). The NFU figures show that the extra labour cost involved in producing half a dozen free-range rather than battery eggs is only 4.3 pence. Likewise, the extra labour cost incurred in the production of half a dozen barn rather than battery eggs is just 1.7 pence.

TABLE 3

**LABOUR COSTS OF PRODUCING EGGS IN
DIFFERENT HUSBANDRY SYSTEMS**

A: As per survey by Roberts and Farrar, 1993

	Battery	Free-range	Perchery
Labour cost per bird per year	£1.06	£2.18	£1.64
Total costs per bird per year	£10.10	£12.80	£11.57
Labour as a percentage of total costs	10.5%	17.03%	14.17%
Egg yield per bird per year	278	254	255
Labour costs of producing one egg	0.38 pence	0.86 pence	0.64 pence

B: As per NFU, 1997

	Battery	Free-range	Perchery
Total production costs per dozen eggs	49.9 pence	66.7 pence	58.5 pence
Labour costs per dozen eggs	4.0 pence	12.6 pence	7.4 pence
Labour costs of producing one egg	0.33 pence	1.05 pence	0.62 pence
Labour costs as a percentage of total costs	8.02%	18.89%	12.65%

3.3 Feed costs in egg production

Table 4 shows that the greatest part of the cost of keeping hens is not labour but feed (this holds true for the rearing of all farm animals). Roberts and Farrar found that, on average, feed costs amount to 56.03% of total egg production costs; the equivalent NFU (1997) figure is 55.29%. Table 4 shows that there is only a small difference in feed costs as between battery and barn eggs. Moreover, the

extra feed costs involved in producing free-range eggs rather than battery eggs amount to just 3.24 pence per half dozen (Roberts and Farrar) or (NFU, 1997) to 2.85 pence per half dozen.

TABLE 4
FEED COSTS INVOLVED IN PRODUCING EGGS IN
DIFFERENT HUSBANDRY SYSTEMS

A: As per survey by Roberts and Farrar, 1993

	Battery	Free-range	Perchery
Feed use per bird per year	43.06 kg.	47.51 kg.	44.72 kg.
Feed costs per bird per year	£6.07	£6.91	£6.25
Total costs per bird per year	£10.10	£12.80	£11.57
Feed as a percentage of total costs	60.1%	53.98%	54.02%
Egg yield per bird per year	278	254	255
Feed costs involved in producing one egg	2.18 pence	2.72 pence	2.45 pence

B: As per NFU, 1997

	Battery	Free-range	Perchery
Total production costs per dozen eggs	49.9 pence	66.7 pence	58.5 pence
Feed costs per dozen eggs	29.2 pence	34.9 pence	32.2 pence
Feed costs of producing one egg	2.43 pence	2.91 pence	2.68 pence
Feed costs as a percentage of total costs	58.52%	52.32%	55.04%

3.3 Farm Management Handbook figures

Data comparing battery and free-range egg production costs have also been produced by Nix, 1996, whose principal data are shown in Table 5. These figures confirm the patterns revealed by the Roberts and Farrar survey. They show that the production costs of a free-range egg are just 1.27 pence higher

than those of a battery egg. On the basis of average egg consumption per person per week of 1.85, the cost per week to the average consumer of changing from battery to free-range eggs need only be 2.35 pence.

As with the earlier data, the Nix figures show that on average labour costs amount to only 14.87% of total egg production costs and that the extra cost - due to increased labour - of half a dozen free-range eggs (rather than battery eggs) is just 3.84 pence.

Turning to feed costs, Nix confirms that feed is by far the largest cost involved in keeping egg-laying hens. As with the earlier figures, Nix shows that there is not a great difference in feed costs as between free-range and battery systems. As regards feed costs, half a dozen free-range eggs cost just 2.64 pence more to produce than the same number of battery eggs.

TABLE 5
COMPARISON OF COSTS INVOLVED IN
BATTERY AND FREE-RANGE EGG PRODUCTION

Based on figures published by Nix, 1996

	Battery	Free-Range
Total costs per bird per year	£12.20	£15.65
Egg yield per bird per year	285	282
Total production costs per egg	4.28 pence	5.55 pence
Labour costs per bird per year	£1.25	£3.05
Labour costs as a percentage of total costs	10.25%	19.49%
Labour costs of producing one egg	0.44 pence	1.08 pence
Food use per bird per year	43 kg.	47.5 kg.
Feed costs per bird per year	£6.67	£7.84
Feed costs as a percentage of total costs	54.67%	50.1%
Feed costs involved in producing one egg	2.34 pence	2.78 pence

3.5 National Farmers Union figures

The National Farmers Union analysis (NFU, 1997) based on average egg production costs in a range of husbandry systems in June 1997 is shown in the following table:

TABLE 6

**NFU FIGURES COMPARING EGG PRODUCTION COSTS
IN DIFFERENT HUSBANDRY SYSTEMS**

	Cage	Perchery	Free-range
Total production costs per dozen eggs	49.9 pence	58.5 pence	66.7 pence
Total production costs for one egg	4.16 pence	4.88 pence	5.56 pence
Percentage increase over cages	-	17.2%	33.7%

3.6 Comparison of egg production costs as shown by different surveys

Table 7 compares the main findings on egg production costs by Roberts and Farrar (1993), Nix (1996) and NFU (1997). All three studies reveal similar patterns; the clear conclusion is that a free-range egg costs around 1.4 pence more to produce than a battery egg. As the average consumption per person per week is 1.85 eggs, consumers could change from battery to free-range eggs for a cost of just 2.6 pence per person per week.

The increase in the average person's weekly food bill of 2.6 pence resulting from changing from battery to free-range eggs must be set against the fact that the average expenditure per person per week on all food amounts to £13.79 (MAFF, 1995a). This means that changing from battery to free-range eggs would lead to an average increase of 0.19% in people's overall expenditure on food, provided that retail prices for free-range eggs were no higher than could be justified by their slightly higher production costs.

TABLE 7

**COMPARISON OF FIGURES ON EGG PRODUCTION COSTS
AS SHOWN BY ROBERTS AND FARRAR (1993), NIX (1996) AND NFU (1997)**

	Roberts & Farrar	Nix	NFU	Average of the three surveys
Cost of producing one battery egg	3.63 pence	4.28 pence	4.16 pence	4.02 pence
Cost of producing one free-range egg	5.04 pence	5.55 pence	5.56 pence	5.38 pence
Difference in cost between producing one battery egg and one free-range egg	1.41 pence	1.27 pence	1.40 pence	1.36 pence

3.7 Shop price differentials

Traditionally the majority of retail outlets have charged significantly more for free-range than for battery eggs. Premium prices are being charged which do much more than simply reflect the higher cost of producing free-range eggs.

If all retailers were to adopt a policy of only charging extra for free-range eggs to the degree needed to cover the slightly higher production costs of such eggs, consumers could change from battery to free-range eggs for the very small additional sums of expenditure referred to earlier in this report.

4.0 PIG PRODUCTION COSTS

Whereas free-range eggs involve slightly higher production costs than battery eggs, outdoor pig production - in the sense of keeping the breeding sows outdoors and then rearing their progeny up to a weight of around 35kg. outdoors - can involve slightly lower production costs than indoor systems (in some years outdoor costs will be lower than indoor costs; in other years the position may be reversed). As will be seen, despite the often-held belief that a move away from intensive farming would lead to much higher food prices, the economics of outdoor pig rearing generally compare favourably with indoor rearing (see Tables 8A & B and 9A & B).

From the point of view of both capital and labour, outdoor pig rearing is less costly than indoor rearing. Capital costs per sow are very much lower in outdoor systems. The capital investment required for establishing a sow herd indoors amounts to around £1,280 a head compared with £210 a head outdoors (estimate by Pig Improvement Company reported in Nix, 1996). Set against this is the fact that outdoor equipment depreciates more quickly than indoor housing and so has a shorter write-off time.

Labour costs too are lower in outdoor than in indoor systems. Thus in the year ended September 1996, labour costs were £100.22 per sow for outdoor weaner producers but £113.43 for indoor weaner producers (MLC, 1997). This amounts to labour costs per pig sold of £4.91 for outdoor weaner producers and £5.25 per pig sold for indoor producers. ('Weaner producers' refers to farmers who breed pigs but sell the progeny for finishing at around 35kg.)

The University of Exeter's study of pig production in 1992-93 also reported lower labour costs outdoors (Sheppard, 1994). This study found that average labour costs per sow per year amounted to £104 in outdoor breeding herds as compared with £143 for indoor breeding herds.

Feed costs are slightly higher for outdoor pig rearing, although this is offset to some degree by greater weight gains in outdoor weaners. For outdoor weaner producers feed costs in the year ended September 1996 per kg. of pig sold were 68 pence, whereas the like figure for indoor weaner producers was 64 pence (based on figures in MLC, 1997).

Sow feed costs per pig reared were higher for outdoor than indoor breeding herds: £11.41 as opposed to £9.09. Interestingly, however, the feed cost per pig reared for the pigs themselves during the rearing stage were lower outdoors than indoors: 39.68 pence per kg. gain outdoors as opposed to 42.46 pence per kg. gain indoors (MLC, 1997). (The rearing stage takes the pig from weaning at about 24 days of age to a weight of around 35kg.) Overall, however, as indicated earlier, feed costs are a little higher in outdoor rearing systems.

Turning to total costs, rearing pigs outdoors proves to be cheaper than indoors when one compares total costs per kg. of pig sold. Total costs per kg. of pig sold in the year ended September 1996 were £1.06 for outdoor weaner producers but £1.08 for indoor weaner producers (based on MLC, 1997

figures). In the year ended September 1995 the like figures were £0.99 outdoors and £1.05 indoors (based on MLC, 1996 figures). On the basis of these figures, outdoor pig rearing appears on average to be around 4% more cost efficient than indoor rearing.

If one looks at net margins per sow (rather than costs per kg. of pig sold), the costs of outdoor rearing are broadly on a par with those of indoor systems. In the year ended September 1995, outdoor rearing produced higher net margins than indoor systems. For outdoor weaner producers the net margin per sow in that year was £106.93, as compared with £72.67 for indoor sows (MLC, 1996). In the year ended September 1996 however, the net margin per sow for outdoor weaner producers was £305.38, as compared with £333.71 for indoor sows (MLC, 1997). (The net margin per sow per year is the total of the net margins on all the pigs to which she has given birth which have been sold in that year).

TABLE 8A

PIG PRODUCTION

COMPARISON OF RESULTS FOR INDOOR AND OUTDOOR WEANER PRODUCERS
YEAR ENDED SEPTEMBER 1995

	Outdoor weaner producers	Indoor weaner producers
Pigs sold per sow	20.9	20.9
Average sale weight	32.7 kg.	30.2 kg.
Feed costs per sow per year	£433.10	£382.92
Other variable costs per sow per year	£40.88	£75.86
Labour costs per sow per year	£91.09	£110.60
Other fixed costs per sow per year	£111.41	£95.10
TOTAL COSTS per sow per year	£676.48	£664.48
Total weight of pigs sold	683.43 kg.	631.18 kg.
Total costs per kg. of pig sold	£0.99	£1.05
Feed costs per kg. of pig sold	63 pence	61 pence
Net margin per sow per year	£106.93	£72.67
Net margin per pig sold	£5.12	£3.48

Source: Pig Yearbook 1996, Meat and Livestock Commission.

TABLE 8B

PIG PRODUCTION

COMPARISON OF RESULTS FOR INDOOR AND OUTDOOR WEANER PRODUCERS
YEAR ENDED SEPTEMBER 1996

	Outdoor weaner producers	Indoor weaner producers
Pigs sold per sow	20.4	21.6
Average sale weight	31.9 kg.	30.0 kg.
Feed costs per sow per year	£445.58	£413.77
Other variable costs per sow per year	£38.81	£75.44
Labour costs per sow per year	£100.22	£113.43
Other fixed costs per sow per year	£107.97	£99.18
TOTAL COSTS per sow per year	£692.58	£701.82
Total weight of pigs sold	650.76 kg.	648.00 kg.
Total costs per kg. of pig sold	£1.06	£1.08
Feed costs per kg. of pig sold	68 pence	64 pence
Net margin per sow per year	£305.38	£333.71
Net margin per pig sold	£14.97	£15.45

Source: Pig Yearbook 1997, Meat and Livestock Commission.

It should be added that MLC (1997) reports a range of results for rearing herds which show outdoor herds performing more efficiently than those kept indoors. The herds in question took pigs from a starting weight of around 6.6 kg. to around 34 kg.

MLC (1997) found that mortality was lower in the outdoor herds: 1.8% as opposed to 3.1% indoors. Likewise the feed conversion ratio was better in the outdoor herds: 1.74 outdoors and 1.85 indoors. Daily weight gain was greater for outdoor pigs (489 g. as opposed to 418 g.), with feed cost per kg. gain being lower in outdoor herds (39.68 pence as opposed to 42.46 pence indoors).

In conclusion, keeping breeding sows outdoors and rearing their progeny up to a weight of around 35 kg. outdoors can involve lower production costs than indoor systems. Generally the economics of outdoor pig rearing compare favourably with indoor rearing. Lower capital costs are the big benefit in outdoor production, but labour costs too are lower in outdoor systems.

TABLE 9A

PIG PRODUCTION

**COMPARISON OF REARING HERD RESULTS FOR OUTDOOR BREEDING HERDS AND
INDOOR BREEDING HERDS, YEAR ENDED SEPTEMBER 1995**

	Outdoor breeding herds	Indoor breeding herds
Weight of pigs at start	6.4 kg.	6.6 kg.
Weight of pigs produced	35.4 kg.	34.5 kg.
Mortality	2%	3.2%
Feed conversion ratio	1.73	1.84
Daily gain	487 grammes	425 grammes
Feed cost per pig reared	£10.77	£10.91
Feed cost per kg. gain	37.15 pence	39.11 pence

Source: Pig Yearbook 1996, Meat and Livestock Commission

TABLE 9B

PIG PRODUCTION

**COMPARISON OF REARING HERD RESULTS FOR OUTDOOR BREEDING HERDS AND
INDOOR BREEDING HERDS, YEAR ENDED SEPTEMBER 1996**

	Outdoor breeding herds	Indoor breeding herds
Weight of pigs at start	6.5 kg.	6.7 kg.
Weight of pigs produced	35.6 kg.	32.5 kg.
Mortality	1.8%	3.1%
Feed conversion ratio	1.74	1.85
Daily gain	489 grammes	418 grammes
Feed cost per pig reared	£11.55	£10.95
Feed cost per kg. gain	39.68 pence	42.46 pence

Source: Pig Yearbook 1997, Meat and Livestock Commission

5.0 LABOUR COSTS AND EMPLOYMENT

As indicated above, moving from intensive husbandry systems to more humane ones does not mean (despite popular mythology to the contrary) that there will be a huge rise in food prices brought about by increased labour costs.

Indeed, in some cases free-range farming requires *less* labour than intensive systems. For example, one stockman can look after more outdoor than indoor-housed breeding sows. MLC (1997) records that labour costs for an outdoor sow amount to £100.22 per year, whereas the like cost for an indoor sow is £113.43.

In the case of egg-laying hens, more labour is needed to look after free-range than battery hens. Nonetheless, the extra sums involved add only a very small amount to egg production costs. Taking an average of Roberts and Farrar's (1993), Nix's (1996) and NFU's (1997) figures, the extra labour costs involved in producing a free-range rather than a battery egg amount to just over half of one penny (0.61 pence). So extra labour costs add just 3.66 pence to the cost of producing half a dozen free-range eggs.

At this stage it is important to note that a huge number of jobs have been lost on UK farms over the last decade. In 1985 the total labour force on UK farms was 693,200. By 1995 this figure had fallen to 607,700 (MAFF, 1995b) - a loss of 85,500 jobs in just ten years. The increasing intensification of modern farming has clearly been a factor contributing to this high level of job losses. Job losses not only involve a great deal of stress and social dislocation, but also impose severe economic burdens on society in terms of funding job seekers' allowance and other associated benefits.

As indicated earlier, in some cases - for example, in the poultry industry - more labour is needed to rear animals extensively. Looked at from the point of view of society as a whole, however, the creation of new jobs in rural areas which generally suffer from high unemployment must be a welcome development. Converting to free-range may mean that as consumers we pay a little more for our eggs and poultrymeat. As taxpayers, however, we will benefit from a lower tax burden as there will be less unemployment to fund. Moreover, those who obtain work will experience very considerable psychological benefits from having a job, as well as the benefits derived from having an increased income.

6.0 HIDDEN COSTS

So far we have looked at production costs, which are relatively easy to measure. Some agricultural economists, however, insist that - in order to obtain a true picture of total costs - one must also take into account what are sometimes referred to as ‘negative externalities’ (Bennett, 1995).

These are the very real indirect costs associated with intensive livestock production, such as environmental pollution and an increased incidence of foodborne disease as well as the poor welfare experienced by intensively reared farm animals. In general these negative externalities (which are examined in detail below) are not given a value in the market “and therefore remain as hidden costs” (Bennett, 1995).

For the reasons given in the Introduction, Compassion in World Farming Trust believes that it is quite wrong for society - when assessing the cost of produce from intensively reared animals - not to take into account the immense amount of suffering imposed on animals by factory farming.

Indeed people’s own well-being may be adversely affected by their knowledge of the very considerable suffering imposed on farm animals by intensive husbandry systems. Bennett (1995) stresses that “people’s perceptions that certain aspects of livestock production give rise to poor farm animal welfare are a potential source of disutility for them [i.e. the people]”. This reduces their (human) welfare, thereby imposing a very real cost on people. Bennett adds that this disutility may be associated with people’s own consumption and/or with other people’s consumption, i.e. with the knowledge that other people are eating produce from factory farmed animals thereby adding to the sum total of animal suffering. In short, poor animal welfare may involve a very real cost for some people.

Turning to the benefit side of a cost-benefit analysis, some people would benefit if the volume of animal suffering were diminished because society prohibited (or reduced) the use of a particular intensive farming system. The key question is: to what extent do citizens in a society want a policy designed to improve animal welfare and the benefits they perceive to result from it (Bennett, 1996a). ‘Public goods’ (goods which benefit the public - or a section of the public - at large) such as improved animal welfare are not easily reflected in market prices. However, an approach - known as ‘contingent valuation’ - has been developed, which seeks to measure how much people are willing to pay for a particular public ‘good’. Clearly it would help policy-makers to know how much people are willing to pay for the benefit of a ban on, for example, the battery cage.

Bennett (1996b) reports the results of such a survey (based on the contingent valuation approach) which sought to find out how much people are willing to pay - through increases in egg prices - to support legislation to phase out battery egg production in the EU by 2005.

A questionnaire was sent in 1995/96 to 2,000 people in Great Britain. The sample was chosen randomly but stratified to reflect the socio-economic characteristics of the general population. 43% of respondents were 'very concerned' that farm animals may be mistreated or suffer in the process of producing our food and 46% were 'somewhat concerned'. 62% of respondents had altered their purchasing behaviour due to their concerns (most commonly by buying free-range instead of battery eggs and by not eating veal).

A double-bounded dichotomous choice method was used to probe willingness to pay. People were asked if they were willing to pay a specified extra amount for free-range eggs. If they answered 'yes' to the first question, they were then asked if they would be willing to pay a higher amount; if they answered 'no' to the first question, they were then asked if they would be willing to pay a lower amount. Bennett points out that this method is statistically more efficient for estimating people's willingness to pay than a single question; the dichotomous choice format is the one recommended for such surveys (Arrow et al, 1993).

Bennett found that some 79% of respondents supported the suggested legislation to phase out the use of battery cages. On average, people were willing to pay an extra 43 pence for a dozen eggs to support a legislative ban on the battery cage. The average consumption per household of respondents was nine eggs per week, for which they were willing to pay on average an extra 32 pence to secure an improvement in hen welfare.

Taking an average of the figures produced by Roberts and Farrar (1993), Nix (1996) and NFU (1997), the production costs involved in producing nine free-range eggs are just 12.2 pence higher than for nine battery eggs. Bennett's survey shows that people are on average willing to pay an extra 32 pence for nine free-range eggs, which would more than cover the extra production costs involved.

In a later paper Bennett (1997) suggests that the willingness-to-pay figure of an extra 43 pence for a dozen free-range eggs may have to be adjusted downwards to 31 pence to take account of certain

possible overstatements by respondents. Even on the basis of the adjusted figure, respondents to the survey were willing to pay an extra 23.25 pence for nine free-range eggs (i.e. the average household egg consumption per week), which more than covers the additional production cost for nine free-range eggs of 12.2 pence.

On the basis of Bennett’s survey, it would appear that British consumers are willing to pay more for the benefit of improved hen welfare than the production costs involved in securing that improvement.

7.0 FOOD SAFETY: The costs associated with foodborne diseases

7.1 Incidence of food poisoning

Notifications of food poisoning have increased dramatically since the early 1960s (ACMSF, 1996). As can be seen from Table 10, notifications of food poisoning in England and Wales rose from 20,702 in 1984 to 82,041 in 1995, an increase of 396%. Turning to notifications per 100,000 population, in 1984 there were 41 notifications of food poisoning in the UK per 100,000 population; that figure had risen to 149 notifications per 100,000 population by 1994 (ONS, 1996).

TABLE 10
NOTIFICATIONS OF FOOD POISONING 1984 - 1996

1984	20,702
1985	19,242
1986	23,948
1987	29,331
1988	39,713
1989	52,557
1990	52,145
1991	52,543
1992	63,347
1993	68,587
1994	81,833
1995	82,041
1996 (provisional)	84,348

Source: Office for National Statistics and Communicable Disease Surveillance Centre

These figures relate to cases which are formally notified and those ascertained by other means. They represent only the tip of the iceberg: for every case which is formally notified there will be many more which go unreported. For a case to be notified it must be sufficiently severe for the victim to go to the doctor and for that doctor then to send a sample to the laboratory for analysis. It is generally accepted that formal notifications need to be multiplied by around thirty to produce the true incidence of food poisoning in the UK. A Ministry of Agriculture survey in 1988 suggested that there were about 2 million cases of foodborne illness in that year (MAFF, 1988). After examining the survey's data, Sockett (1993) concluded that only around 1 in 38 of all cases were formally reported.

Turning to particular kinds of food poisoning, campylobacter is now the most commonly reported cause of food poisoning in England and Wales according to Public Health Laboratory Service data. There are over 40,000 reported cases of campylobacter in England and Wales each year. Reported cases of salmonella poisoning have more than doubled in the last ten years. It is the second most frequently reported cause of food poisoning with almost 30,000 cases a year being reported in England and Wales. Campylobacter and salmonella can cause diarrhoea, vomiting and severe abdominal pain; in extreme cases they can lead to death.

In 1995 there were 792 reported cases of E.coli O157 poisoning in England and Wales. In late 1996 an outbreak of E.coli poisoning in Lanarkshire affected around 400 people and led to the deaths of 20 of them.

Cowden et al (1995) reported that in 1992 and 1993 the Communicable Disease Surveillance Centre of the Public Health Laboratory Service ascertained 1,025 general outbreaks of infectious intestinal disease in England and Wales. 56% of these were reported as mainly foodborne. The outbreaks of foodborne infectious intestinal disease led to 11,000 people becoming ill, 365 people being admitted to hospital and 15 deaths. Cowden et al (1995) stated that "These figures are likely to underestimate the total because many general outbreaks are not ascertained". They added that "outbreaks of salmonellosis were associated with the highest morbidity and mortality".

7.2 Contribution of animal produce to food poisoning

Compassion in World Farming Trust believes that a significant proportion of food poisoning results from animal produce which contains bacterial infections. The Advisory Committee on the

Microbiological Safety of Food (ACMSF) has stated that estimates from the literature suggest that 20% - 35% of reported human cases of salmonellosis are due to poultry meat (ACMSF, 1996). Cowden et al (1995) reported that “poultry and eggs remain common vehicles of infection for salmonella enteritidis”. Similarly a Broilact paper states that “poultry remains a significant vehicle of human salmonellosis” (Broilact).

Campylobacter jejuni - which is one of the principal causes of food poisoning in England and Wales and which can produce severe illness - is often associated with poultry and other meat (Mead and Hudson, 1987). Waites et al (1981) state that *campylobacter jejuni*'s “source of contamination is undoubtedly animals”.

Two recent reports have shown serious problems in broilers (broilers are the chickens reared for their meat and are a totally separate flock from the egg-laying hens). Early in 1996 the ACMSF reported that raw poultry meat is a significant carrier of pathogens, particularly salmonella and campylobacter (ACMSF, 1996). The Committee noted that a 1994 survey by the Public Health Laboratory Service found 41% of UK-produced frozen chickens to be infected with salmonella, while 33% of chilled chickens contained salmonella. The ACMSF also reported that a 1994 EC survey found 44% of UK-produced chickens to be infected with campylobacter. As indicated above, campylobacter and salmonella are the two main causes of food poisoning in the UK.

In October 1996 *Which* reported the results of examining two samples of chickens bought at a range of supermarkets and (in the case of the second sample) butchers. The first sample contained 90 chickens and chicken portions which were examined for *Which* by a poultry expert from the Royal College of Veterinary Surgeons. He judged 32 of the 90 birds to be ‘unfit for human consumption’ as defined in the relevant poultry meat regulations. In the second sample (which included both fresh and frozen chickens) *Which* found half the chickens to be contaminated with either salmonella or campylobacter bacteria.

Having examined all the evidence the ACMSF concluded that “it is clear that poultry meat continues to be a significant route for the transmission of salmonella and campylobacter into the industrial , domestic and catering environments”. They added that poultry meat has become one of the most frequently suspected vehicles for organisms causing salmonellosis and campylobacteriosis.

7.3 Role of intensive animal husbandry

Compassion in World Farming Trust believes that intensive farming - with its tendency to cram a large number of animals into severely overcrowded conditions - is an important factor contributing to the bacterial infection of meat. Certainly intensive husbandry's overcrowded conditions facilitate the rapid spread of bacteria once they are introduced into the animals' housing.

In considering the contribution of intensive animal husbandry to foodborne disease, it is worth remembering that, as indicated above, poultry meat is a significant vehicle of both salmonellosis and campylobacteriosis in humans. In this context it must be stressed that nearly all of the 700 million broiler chickens slaughtered each year in the UK are factory farmed. The birds are kept in huge, windowless sheds which are so overcrowded that as the birds gain weight, one can barely see the floor so thickly is it 'carpeted' with chickens.

The shed's floor is covered with litter - usually woodshavings. This is rarely cleaned or changed from the time when the birds are put into the shed at about one day old until they are removed at their slaughter age of 42 days. As the days go by, the litter often becomes increasingly contaminated with poultry manure.

Plummer et al (1995) found that chicken breasts were contaminated with salmonella at a significantly higher rate than other bird parts. It may be that the greater contamination of breasts is due to fecal contamination arising from the fact that broilers - bred to grow so quickly that their legs cannot properly support their bodies - spend a considerable amount of time lying down on their breasts on the sometimes dirty litter (Shackleford, 1988).

Bearing in mind the overcrowded, sometimes unhygienic conditions - often with high levels of dust and airborne bacteria - in which intensively reared animals are kept, it is hardly surprising that many are unhealthy and harbour disease. The extent of the problem is highlighted by the fact that the vast majority of pigs and poultry in the UK and the rest of the EU are routinely given antibiotics in their feed and/or water, some to act as growth promoters and others to prevent the diseases which are inevitable in intensive farming. No system which is dependent on the *routine* use of antibiotics can be thought of as healthy or prudent.

Moreover, research now suggests that the overuse of antibiotics in farming may have encouraged the development of bacteria which are resistant not just to the antibiotics used in animal feed, but also to some of those used to treat serious bacterial infections in humans (Klare et al, 1995). This development could involve very serious economic and social costs as a result of an increased difficulty in treating human disease. The concern about this issue is illustrated by the fact that the European Commission has - as a precautionary protective measure - banned the use of avoparcin in animal feed from April 1997 because of fears that such use is capable of encouraging resistance to the antibiotic vancomycin, an antibiotic of last resort used in the treatment of serious illnesses in humans.

Waites et al (1991) took the view that “the whole of the food chain, from the farm to the plate, must be considered in developing an understanding of sources of foodborne microbial illness”. Likewise Cowden et al (1995) concluded that “reducing the incidence of salmonella food poisoning will be difficult unless control occurs on farms and in abattoirs and processing plants”.

It is generally accepted that BSE has been caused by the highly intensive practice of feeding to cattle the remains of sheep or cattle (which remains proved to be infected). Traditionally cattle have been fed on grass, hay and root crops such as mangels and turnips. Among the principal reasons for the development whereby animal protein was included in cattle feed was the desire to encourage unnaturally high milk yields in dairy cows and enhanced growth rates in calves.

BSE - which is now thought to be linked to new variant CJD - has resulted in huge costs both in monetary terms and in terms of the immense amount of suffering experienced by the victims of nvCJD and their families and friends, by the farming community and by the tens of thousands of cows who have suffered from a painful and disabling disease before being slaughtered.

The BSE crisis has led to very high public expenditure in respect of ‘clean-up’ costs. A Soil Association paper reports that the total gross expenditure on BSE control in the period 1988 - March 1996 amounted to £237.6 million. In an Answer on 6 November 1996 to a Parliamentary Question, the government stated that total UK expenditure to that date in respect of BSE amounted to £700 million. Even this figure, however, was dwarfed when on 26 November 1996 Douglas Hogg MP, the Minister of Agriculture, reported that about £3.3 billion had been set aside for BSE-related expenditure (MAFF, 1996b). He explained that additional provision for BSE-related measures had been set at £730 million in 1997/98, £580 million in 1998/99 and £490 million in 1999/2000. In a speech to the

National Farmers Union AGM on 5 February 1997 Mr Hogg said that the £3.3 billion committed to BSE-related expenditure “is the equivalent of 2p on income tax”. Then on 27 June 1997 The Times and the Daily Telegraph reported that Treasury officials were warning that BSE-related costs could reach £4.2 billion.

Threats to food safety reside not only in intensive farming practices but also in intensive slaughter plants. Modern high throughput abattoirs not only pose serious threats to animal welfare, but are also a factor contributing to food poisoning. Earlier we referred to the high levels of salmonella and campylobacter in poultry meat reported by the Advisory Committee on the Microbiological Safety of Food (ACMSF). In its 1996 report the ACMSF identified slaughterhouses as being a factor in this situation and concluded that “slaughter and processing operations give rise to a very wide range of practices which can have a very serious effect on the spread of microbiological contamination and the microbiological status of birds”.

Similarly as regards red meat, the Richmond Committee on the Microbiological Safety of Food pointed out that the high speeds of modern slaughterhouse equipment operation can result in an increased microbiological hazard (Richmond, 1991). Hudson et al (1996) have stressed the importance of good abattoir practices in controlling cross-contamination of carcasses with pathogens.

More recently in March 1997 several newspapers revealed the findings of a draft report prepared in 1995 by government meat hygiene inspectors. According to the Financial Times, this unpublished report said that due to poor dressing procedures, animal faeces were finding their way on to and contaminating carcasses being prepared for human consumption (FT, 1997); these faeces could harbour pathogenic strains of the E.coli bacterium. The report added that contamination of meat with stomach or intestinal contents was observed. Faecal pellets and rectal tissue in sheep, hair and singeing residue in pigs, and bile stains were also found.

The report also said that many abattoirs were accepting filthy animals for slaughter and that such animals can be a further cause of contamination; the report pointed out that E.coli O157 and salmonella can be introduced into abattoirs on the skins of dirty livestock.

In April 1997 the Report by Professor Hugh Pennington into the tragic 1996 E.coli outbreak in Scotland was published. This stressed that the most obvious way in which E.coli spreads is when

carcasses become contaminated with animal faeces - either from dirty hides or when faeces leak or burst from the animals' intestines during their removal at slaughter (Pennington, 1997). Such faecal contamination is arguably much more likely in modern high throughput slaughter plants.

7.4 Economic and social costs

Food poisoning not only causes suffering (and in extreme cases, death) but also involves significant economic and social costs, for example in terms of the costs of medical treatment and the loss of output associated with the number of days lost at work each year. Although it is difficult to estimate the economic costs of food poisoning, a number of helpful studies have been undertaken.

Sockett (1993) concluded that food poisoning costs the UK economy between £0.5 - 1.0 billion a year (at 1988 prices). Sockett stressed that in arriving at this estimate no account was taken of the medical and social costs of the long-term consequences of food poisoning and that therefore his figures “probably underestimate the range”. More recently, a Compassion in World Farming Trust report on factory farming and human health has estimated that the annual cost of food poisoning to the UK economy is well over £1 billion, and perhaps nearer £3 billion (O’Brien, 1997).

In its 1996 report the Advisory Committee on the Microbiological Safety of Food concluded that “the true economic and social costs of human foodborne illness associated with poultry meat (including sickness-related absence from work, loss of life, and general discomfort from illness), while difficult to estimate, are likely to be substantial”. Broilact’s paper states that “the cost of salmonellosis adds significantly to the cost of both health care and food production, as well as the more obvious personal costs”. It adds that the total cost to the UK economy is “more than substantial”. Referring to foodborne disease, Sockett (1993) writes that there is increasing recognition that “the socioeconomic impact may be huge”.

Sockett and Roberts (1991) conducted a national survey of 1,482 laboratory-confirmed salmonella infections in England and Wales between August 1988 and March 1989. The researchers sought to identify the following costs:

- a) public sector costs, being comprised of:

- i) costs that fall on the health sector which is directly involved in the care of the patients, and
 - ii) costs incurred by the public health authorities responsible for investigating the outbreak;
- b) costs to industry in terms of lost production; and
- c) costs incurred by the affected individuals and their families.

Sockett and Roberts concluded that the 1,482 cases led to overall costs of £996,339 (this is probably an underestimate as the authors did not have the full costs for all the cases). Average cost per case was £788. 51% of the costs (£507,555) resulted from lost production due to sickness-related absence. Over a third (£392,822) were public sector costs; of these, 60% (£235,660) were medical (NHS) treatment costs and 40% (£157,162) were public health costs incurred in investigating the outbreak (these comprise environmental health department and laboratory testing costs).

The researchers concluded that the costs revealed by their study “suggest that human salmonellosis is expensive to the public sector, industry and families”. They pointed out that based on the 23,000 reported cases of salmonella in 1988, public sector costs would have been about £6.8 million, while costs to industry from lost production would have been £9.5 million. Overall costs would have been £18.1 million. They added that “these are under-estimates of the true costs since they take no account of costs of unreported cases or estimates of costs of general discomfort of the illness or lives lost or indeed the longer term sequelae of infection”. ACMSF (1996) points out that such longer term consequences can include bone-joint infections and neurological disorders. Sockett (1991) stressed that no intangible costs were included in the Sockett and Roberts study, but that “inclusion of the lowest estimates for loss of life would have almost doubled the total. In addition, a small proportion of cases may develop chronic illness including reactive arthritis and malabsorption syndromes [i.e. malabsorption of essential nutrients which can result in compromise of the immune system] which may require treatment over short or extended periods of time. Thus the preliminary results of this study represented the minimum annual costs of reported salmonellosis”.

If one takes Sockett and Roberts’ figures and applies them to the 29,717 cases of salmonella in humans reported in England and Wales in 1995, overall costs would have amounted to £23.44 million. Of

these overall costs, public sector costs would have amounted to about £8.85 million, while costs to industry from lost production would have been around £12.27 million. (These figures have not been adjusted for inflation and are based on 1988/89 prices).

Yule et al (1988) estimated the total costs associated with a hospital outbreak of poultry-borne (turkey) salmonellosis in Scotland to be £542,162. The average cost per reported case was £2,240. Yule et al's figures per case are higher than those of Sockett and Roberts because they sought to place monetary values on pain, grief and suffering and on loss of life. If Yule et al's figures are extrapolated, they suggest that the costs of poultry-meat associated salmonella in Scotland in 1985 were in the region of £5.5 million.

The costs of poultry meat-associated salmonellosis in England and Wales in 1990 were estimated to be £15.6 million by Persson and Jendteg (1992). In an unpublished paper to the ACMSF, Sockett estimated that in 1992 the tangible costs of poultry meatborne salmonellosis in England and Wales ranged from £70 million to £200 million, with production loss to industry due to sickness-related absence from work accounting for the largest proportion of costs.

ACMSF (1996) reported that limited studies suggest that the costs of campylobacter infection may be similar to those arising from salmonella. Sockett and Pearson (1987) concluded that although the costs of campylobacter infection may be similar to those of salmonella, campylobacter costs "may be more significant nationally in view of the larger number of cases of campylobacter infection currently recorded".

Sockett and Pearson (1987) examined 53 laboratory-confirmed cases of campylobacter in England between April-June 1986. The total costs associated with these 53 cases amounted to £31,113 with the average cost per case being £587. The costs of health care and investigation of the outbreaks by environmental health departments came to £7,129 (23% of total costs).

The estimated value of lost productive output was £6,883 (22% of total costs). The researchers commented that "diarrhoeal illnesses, including campylobacter infection, may have a considerable annual impact on national productivity in both days off work and reduced efficiency".

An allowance for “pain and suffering” of £16,646 was used to measure the intangible costs associated with discomfort, loss of leisure and reduced efficiency on the part of the affected individuals, and loss of work, leisure and sleep and absence from work or school by those caring for the sick. The authors stressed that campylobacter may have a “considerable impact on the daily activities of sick individuals and those who care for them”.

The US Department of Agriculture’s Economic Research Service estimated the 1992 medical and productivity costs attributable to foodborne pathogens associated with meat and poultry. Salmonella-related costs amounted to \$600 - 800 million, with campylobacter costs coming to \$450 - 500 million (reported in ACMSF, 1996). El-Gazzar and Marth (1992) stated that the annual cost of foodborne illness in the United States is estimated to be \$7.7 to \$8.4 billion. Sockett (1993) refers to studies of the costs of salmonella infection in Germany and Canada which suggest annual costs of tens of millions of marks or dollars respectively resulting from human infection.

It is clear from the above that foodborne disease has very serious economic implications, with medical costs and lost production (due to sickness-related absence from work) being the most significant items.

8.0 CONCLUSIONS

1. There is a widespread assumption that a move away from intensive animal farming will lead to a big increase in the cost of producing our food. In fact this assumption often proves to be incorrect. In some cases the production costs involved in rearing animals humanely are only slightly higher than - and sometimes even below - those incurred in intensive systems.
2.
 - a) A number of studies carried out over the last few years reveal that a free-range egg costs just 1.4 pence more to produce than a battery egg.
 - b) Ministry of Agriculture figures show that average egg consumption per person per week in the UK is 1.85 eggs. With a free-range egg costing only 1.4 pence more to produce than a battery egg, consumers could change from battery to free-range eggs at a cost of just 2.6 pence per person per week, provided that retail prices for free-range eggs were no higher than could be justified by their slightly higher production costs.

- c) The increase in the average person's weekly food bill of 2.6 pence resulting from changing from battery to free-range eggs must be set against the fact that the average expenditure per person per week on all food amounts to £13.79 (Ministry of Agriculture figures). This means that changing from battery to free-range eggs need only lead to an average increase of 0.19% in people's overall expenditure on food.
 - d) If retailers only charged extra for free-range eggs to the degree needed to cover the slightly higher production costs of such eggs, consumers could change from battery to free-range eggs for the very small additional sums referred to earlier.
3. The economics of outdoor pig rearing generally compare favourably with indoor rearing. In many years outdoor pig rearing involves slightly lower production costs than indoor systems. A range of economic indices show outdoor pig rearing to be more efficient than indoor production. Mortality is lower in outdoor herds. Feed conversion ratios are better in outdoor herds, with daily weight gain being greater for outdoor pigs.
4. The relatively small price increases involved in changing from intensive farming to free-range come at a time when our food is costing us less - both as a proportion of overall expenditure and in relation to average price levels - than ever before.

In 1940, over 30% of total consumer expenditure was on household food, whereas by 1995 this figure had fallen to 11%.

Moreover, food prices have been rising at a much lower rate than prices in general. In 1985 the retail price index (1990 = 100) for an average shopping basket was 74, with food - at 80 - being more expensive than the average item. By 1996 the position had reversed: food - at 119 - had become less expensive than the average item which cost 121.

At a time when our food has become much cheaper in real terms than ever before, it could be argued that we as a society could afford to pay the relatively small extra sums needed to ensure that animals are reared in good conditions.

5. In some cases free-range farming requires *less* labour than intensive systems. For example, one stockperson can look after more outdoor than indoor-housed breeding sows. Where more labour is needed it adds only a small amount to production costs; for example, extra labour adds under four pence to the cost of producing half a dozen free-range eggs.

Moreover, looked at from the point of view of society as a whole, in those cases where more labour is needed, the creation of new jobs in rural areas - which generally suffer from high unemployment - must be a welcome development. Converting to free-range may mean that, as consumers, we pay a little more for eggs and poultry meat. As taxpayers, however, we will benefit from a lower tax burden as there will be less unemployment to fund.

6. To get a true picture of total costs, one must look not just at the production costs, but also at certain indirect costs associated with intensive farming. These include environmental pollution and an increased incidence of foodborne disease as well as the poor welfare experienced by intensively reared animals.

These 'hidden' costs are not reflected in the market price of our food. We pay for them, nonetheless, whether as taxpayers who have to fund the costs of dealing with BSE or the NHS costs incurred in treating food poisoning, or through our water bills which are inflated by the expense incurred in cleaning up rivers polluted by intensive farming.

These 'hidden' costs include:

- a) The cost of dealing with periodic crises such as BSE. Treasury officials have warned that BSE-related costs could reach £4.2 billion.
- b) The costs associated with foodborne disease. Notifications of food poisoning have increased by almost 400% between 1984 and 1995. Food poisoning not only causes suffering (and in extreme cases, death), but also involves substantial economic costs, such as the costs of medical treatment and costs to industry in terms of lost production due to sickness-related absence from work. One survey (using 1988 figures) has concluded that food poisoning costs the UK economy between £0.5-£1.0 billion a year, although its author said that his figures "probably underestimate the range". More

recently a Compassion in World Farming Trust report on factory farming and human health has estimated that the cost of food poisoning to the UK economy is well over £1 billion, and perhaps nearer £3 billion, every year.

- c) Damage to the environment. Slurry (animal wastes) and silage effluent can pollute water courses and present significant risks to the aquatic life of streams and rivers. Moreover, a huge amount of grain is produced to feed intensively reared animals. The over-use of chemical fertilisers and pesticides in the production of that grain can lead to pollution of water courses and drinking water¹.

¹The topic of environmental costs has been covered in Compassion in World Farming Trust's 1999 report *Factory Farming and the Environment*.

References

- ACMSF, 1996. Report on poultry meat. Advisory Committee on the Microbiological Safety of Food. HMSO, London.
- Arrow K., Solow R., Portney P.R., Leamer E.E., Radner R. and Schuman H., 1993. Report of the US National Oceanic and Atmospheric Administration Panel on contingent valuation. 11.1.93. Resources for the future. Washington D.C.
- Bennett R.M., 1997. Farm animal welfare and food policy. Food Policy, August, 1997.
- Bennett R.M., 1996a. People's willingness to pay for farm animal welfare. Animal Welfare 1996, 5: 3-11.
- Bennett R.M., 1996b. Willingness-to-pay measures of public support for farm animal welfare legislation. Veterinary Record 139: 320-321.
- Bennett R.M., 1995. The value of farm animal welfare. Journal of Agricultural Economics. Vol. 46, No. 1: 46-60.
- Broilact. The economic and social costs of salmonellosis.
- Commission, 1996. Statement by European Commission on veal crates. 24 January, 1996.
- Cowden J.M., Wall P.G., Adak G., Evans H., Le Baique S. and Ross D., 1995. Outbreaks of foodborne infectious intestinal disease in England and Wales : 1992 and 1993. CDR Review. Vol. 5, Review No. 8 : R109-R117.
- El-Gazzar F.E. and Marth E.H., 1992. Foodborne disease : investigative procedures and economic assessment. Journal of Environmental Health 1992. Vol. 55, No. 2 : 24-27.
- FT, 1997. Abattoirs under fire for poor hygiene. George Parker, Financial Times. 6 March 1997.
- Hudson W.R., Mead G.C. and Hinton M.H., 1996. Relevance of abattoir hygiene assessment to microbial assessment of British beef carcasses. Veterinary Record. 14.12.96. pp. 587-589.
- Klare I., Heier H., Claus H., Reissbrodt T. and Witte W., 1995. VanA-mediated high-level glycopeptide resistance in enterococcus faecium from animal husbandry. FEMS Microbiology Letters 125 (1995) 165-172.
- MAFF, 1988. Ministry of Agriculture, Fisheries and Food. Report on a consumer survey. HMSO, London.
- MAFF, 1991. Agriculture in the United Kingdom, 1991. HMSO, London.
- MAFF, 1995a. National Food Survey, 1995. The Stationery Office, London.
- MAFF, 1995b. The Digest of Agricultural Census Statistics: United Kingdom, 1995. The Stationery Office, London.
- MAFF, 1996a. Agriculture in the United Kingdom, 1996. HMSO, London.

- MAFF, 1996b. Ministry of Agriculture, Fisheries and Food. Press Release headed 'Budget boost for public safety'. 26 November 1996.
- Mead G.C. and Hudson W.R., 1987. Survival of campylobacters on air-chilled broiler carcasses held under different conditions. *British Poultry Science*, 28 : 776.
- MLC, 1996. Pig Yearbook 1996. Meat and Livestock Commission, Milton Keynes.
- MLC, 1997. Pig Yearbook, 1997. Meat and Livestock Commission, Milton Keynes.
- NFU, 1997. Egg Production Bulletin, July 1997. National Farmers Union.
- Nix J. with Hill P., 1996. Farm Management Handbook: 27th edition. Published by Wye College Press, Wye College, near Ashford, Kent.
- O'Brien T., 1997. Factory farming and human health. Compassion in World Farming Trust, August 1997.
- ONS, 1996. Office for National Statistics together with the Scottish Office and the Department of Health and Social Services, Northern Ireland.
- Pennington, 1997. The Pennington Group. Report on the circumstances leading to the 1996 outbreak of infection with E.coli O157 in Central Scotland, the implications for food safety and the lessons to be learned. Edinburgh: The Stationery Office.
- Persson U. and Jendteg S. The economic impact of poultry-borne salmonellosis: how much should be spent on prophylaxis? *International Journal of Food Microbiology* 1992; 15 (3/4) : 207-213.
- Plummer R.A.S., Blissett S.J. and Dodd C.E.R., 1995. Salmonella contamination of retail chicken products sold in the UK. *Journal of Food Production*. Vol. 58, No. 8 : 843-846.
- Rawles K., 1997. What price suffering? Our responsibility for the welfare of farm animals. Paper given at Conference 'Counting the cost of industrial agriculture' organised by the Soil Association. 3 January 1997.
- Richmond, 1991. The microbiological safety of food: part II. Report of the Richmond Committee on the Microbiological Safety of Food. HMSO, London.
- Roberts D. and Farrar J., 1993. The economics of egg production: 1992. Special studies in agricultural economics, Report No. 22. Department of Agricultural Economics, University of Manchester.
- SVC, 1996. Report on the welfare of laying hens. European Commission's Scientific Veterinary Committee: Animal Welfare Section. Brussels, 30 October 1996.
- Shackleford A.D., 1988. Modification of processing methods to control salmonella in poultry. *Poultry Science* 67 : 933-935.
- Sheppard A., 1994. Pig production 1992-93. Special studies in agricultural economics, Report No. 25. Agricultural Economics Unit, University of Exeter.

Sockett P.N., 1991. The economic implications of human salmonella infection. *Journal of Applied Bacteriology* 1991. 71 : 289-295.

Sockett P.N., 1993. Social and economic aspects of foodborne disease. *Food policy*, April 1993: 110-119.

Sockett P.N. and Pearson A.D., 1987. Cost implications of human campylobacter infections. In *Campylobacter IV: Proceedings of the Fourth International Workshop on Campylobacter Infections*: eds. Kaijser B. and Falsen E. Goteberg, Sweden.

Sockett P.N. and Roberts J.A., 1991. The social and economic impact of salmonellosis. *Epidemiol Infect* 1991; 107: 335-347.

Soil Association, 1996. *Industrial agriculture : counting the costs*. September 1996. Soil Association, Bristol.

Van Horne P.L.M., 1996. Production and economic results of commercial flocks with white layers in aviary systems and battery cages. *British Poultry Science* 37: 255-261.

Waites W.M., Dodd C.E.R. and Bolton K.J., 1991. Microbial food poisoning : problems and solutions. *British Food Journal*. Vol. 93 No.1, 1991 : 4-9.

Yule B.F., Macleod A.F., Sharp J.C. and Forbes G.I., 1988. Costing of a hospital-based outbreak of poultry-borne salmonellosis. *Epidemiol Infect* 1988; 100(1) : 35-42.