INTRODUCTION

In September 1995, a six months study was initiated to assess the major animal health and welfare constraints in UK organic livestock systems. The principal aim of the study was to identify research priorities required for further development of this sector. In particular, the study was designed to gather information on livestock management and health status directly from organic producers.

European agriculture has, over the past decades, been dominated by high input and high output systems. Scientific and public concerns over intensive agricultural practices have, however, increased in the recent years. Some commentators have predicted a more extensive agricultural future (North, 1990; HMSO, 1990; Neville-Rolfe, 1990; Taylor and Dixon, 1990; Hodges and Scofield, 1988; Lampkin, 1990). Simultaneously, there is an increasing awareness that organic farming practices may provide an opportunity to supply food that meets changing consumer demands and satisfies the requirement for more environmentally acceptable systems of production.

There has been an unprecedented increase in organic farming in Europe during the last decade (Vogtmann, 1995). In some countries, this has also been reflected in a growing number of livestock managed organically. However, whilst there has been a general increase in the research into organic farming, little attention has been directed to animal health and welfare issues (Borgen, ed., 1995; Lampkin, personal comm.).

The philosophy of organic farming emphasises the need to produce food in an "integrated, humane, environmentally and economically sustainable agricultural production system" (Lampkin and Measures, 1995). The organic standards, laid down in the UK by the United Kingdom Register of Organic Food Standards (UKROFS, 1993), have the following key principles:

- The husbandry systems must conform to the highest welfare standards;
- The animals must be fed with feeds that suit their physiology;
- The feed is mainly produced on the farm;
- Animal health should be maintained through sound preventive husbandry, animal welfare and appropriate housing and feeding systems;
- The use of prophylactic chemotherapy and vaccinations is avoided but acceptable under special circumstances;
- Homeopathy and other alternative therapy regimes are encouraged in disease situations but the use of conventional chemotherapy is acceptable to avoid animal suffering.

These principles require substantial changes to conventional, intensive animal husbandry systems. Concerns have been expressed about the potential impact of these changes on animal health and welfare (Andrews, 1991). However, it has also been suggested that organic livestock systems offer opportunities to introduce improved husbandry methods that have long been recognised to be of general benefit to animal health and welfare (Vaarst, 1995).

Therefore, although the study of organic farming must consider the system as a whole, this particular study placed particular emphasis on the health and welfare of livestock in order to identify areas of research most likely to benefit organically managed animals, organic producers and the consumer.

METHODOLOGY

Three distinct methods were adopted in this study:
A review of the literature;
Informal interviews/visits with individuals/organisations involved in organic farming, in order to gain background information and opinions;
A formal questionnaire survey of organic livestock producers.

**Review of the Literature**

A comprehensive search of the literature relating to organic farming was completed with particular emphasis on animal health and welfare issues. A review of the main references is included in this report.

During the study, a large number of articles relating to organic farming have appeared in the popular national and farming press in response to public debate over the incidence of BSE and CJD. It has not been possible yet to review all of these recent articles.

**Institutional links, key informant interviews and farm visits**

In order to broaden the view of organic farming, a number of institutional links, interviews with key informants and visits to organic farms were completed. In the UK there are a number of organisations and institutes working on and committed to the adoption, promotion and study of organic farming methods. A full list of addresses of these organisations is provided in Lampkin (1994) and Lampkin and Measures (1995).

The following key institutes were visited:

- Elm Farm Research Centre, Newbury, Berkshire
- Centre for Organic Husbandry and Agroecology, University of Wales, Aberystwyth
- Institute of Grassland and Environmental Research, Ty Gwyn Farm, Trawsgoed, Aberystwyth
- The Royal Society for the Prevention of Cruelty to Animals

Meetings with key members of the following organic associations were also held:

- The Soil Association
- United Kingdom Register for Organic Standards
- Scottish Organic Producers’ Association
- International Federation of Organic Movements

In order to gain an insight into organic farming methods in practice, visits were also made to five organic livestock farms.

**Postal survey of organic producers**

The main source of data for this study was provided by a postal survey of organic livestock farmers. A questionnaire was developed and posted to farmers during December 1995.

The objectives of the questionnaire survey were:

- to gain background information on disease management and animal health status on organic livestock farms;
- to identify animal health and welfare research priorities in the organic sector;
- to establish links with potential study participants.

The main survey target groups were livestock producers who are registered with UKROFS. The names and addresses of producers were supplied by the Soil Association.

The questions included in the questionnaire can be broadly divided into four categories.

1. General farm details (type and size of enterprise, etc);
2. Description of individual production systems (production levels, breeds, etc);
3. Management and husbandry practices related to animal health and welfare (housing, disease prevention, etc);
4. Producers perception of disease.

The producers perception of disease was based on a subjective assessment of a range of common conditions. It was not intended to provide quantitative epidemiological information. The objective was to identify key areas, as identified by the farming community, requiring further research.

The design of the questionnaire was constrained by the need for simplicity and ease of completion. A pilot questionnaire was tested on a number of farmers and other individuals. The questionnaire form is attached as Appendix 1.

The questionnaire returns were entered onto computer using the Microsoft Access database program. The analysis of data was completed using the Access and Excel programs.

**RESULTS**

**A Review Of The Literature**

The standards for animal health and welfare in organic farming in the UK are set out by UKROFS (1993) and the Soil
organically managed cows. The fertility 1993). No significant into two groups: one
In an experimental study in Germany, 60 dairy cows were housed under
organic feeding regimes were more successful in rates and the mean age of culling were also
considerably lower than in those recorded on conventional farms. Alternative treatment strategies were used in the majority of cases. The incidence of lameness, milk fever and post-calving problems was lower on the study farms compared to the national average on conventional farms.

Lowman (1989) reports on the successful prevention of the most common diseases of beef cattle with homeopathic nosodes in a trial comparing organic and conventional management of beef cattle from 1 week to 22 months of age in Scotland. No specific disease problems among the organic group were detected in comparison to the conventional group. Younie (1989) identifies parasitic gastroenteritis as the main parasitic disease in organic beef rearing systems. An on-farm study of organic sheep (Newton, 1989) in Devon suggests no major disease problems in spite of no vaccination against clostridial diseases. Successful treatment of fly strike with ivermectin and control of parasites by grazing and management policies are also described.

Most other scientific papers published on the subject of animal health and welfare in organic livestock production originate from the Scandinavian countries, Germany, Switzerland and the Netherlands. All these countries have a considerably larger number of organic farms involved in livestock production than the UK.

The Danish Institute of Animal Science runs an extensive research programme on organic farming. The main emphasis of the research is on animal production, feeding and housing systems and nutrient flows on organic livestock farms. A considerable amount of research work is also being carried out on poultry welfare and dairy cow health (Sorensen, 1996; Vaarst, 1995; Vaarst et al., 1993, Vaarst et al. 1992; Vaarst et al., 1991). Vaarst found that the disease situation on 14 organic dairy farms was comparable with conventional Danish dairy farms, with a lower incidence of lameness and lower veterinary costs. Mastitis was again recognised as the major health problem. Jørgensen and Roepstorff (1991) found that most of the health problems noted in a small sample of organic pig units in Denmark were related to new pigs being brought into the herd.

A 2-year study of 22 Norwegian organic dairy herds (Ebbesvik, 1993) revealed that although milk production was considerably lower than in conventional herds, they had a lower incidence of mastitis, milk fever and ketosis. Fertility rates and the mean age of culling were also higher than the national average. As part of the same research project, Ingrid Olsen (personal comm.) studied the concentration of ketone bodies in the milk and blood of organically managed dairy cows and found that the levels were significantly lower than in conventional dairy cows. This suggests that organic feeding regimes were more successful in maintaining metabolic energy balances during lactation.

In an experimental study in Germany, 60 dairy cows were housed under similar environmental conditions and divided into two groups: one managed and fed according to organic standards and the other conventionally (Von Weber et al., 1993). No significant differences were detected in the health parameters apart from higher somatic cell counts in the organically managed cows. The fertility parameters, however, were significantly more favourable in the organic group.
Niezen et al. (1991) report on a research unit in New Zealand established to study organic production systems. The objectives of the unit are to identify the major constraints to sheep and cattle production and arable cropping under a synthetic chemical free input system, to provide a model for a lower synthetic chemical input sustainable agricultural system and to determine the inputs required for such systems. The unit also monitors production ecosystems once synthetic chemicals are eliminated, including the ecology of animal parasites, particularly nematodes and blow flies. The published report details the findings of a research programme for successful internal parasite control in sheep.

A significant contribution to animal welfare research in organic farming comes from the University of Kassel, with its units of organic animal husbandry and farm animal behaviour and management. Species specific animal husbandry (artgemasse Tierhaltung) is introduced in the work of Rist et al. (1992). This is an excellent textbook on animal behaviour and cattle husbandry which considers these issues in a management system that fulfils the requirements of most organic standards.

Bartussek (1988, 1991, 1995) developed various systems of welfare index (Tiergerechtheitsindex TGI-35L) to assess the animal welfare standards on organic farms. These indexes has been widely used in southern Germany and has been included in the local animal welfare legislation as a guideline. Sundrum et al (1994) further developed the indexing system by adding parameters and improving the reproducibility and meaningfulness of the assessment procedure (Tiergerechtheitsindex 200).

Danish welfare research on organic farms has concentrated on evaluating the significance of the "management factor" on animal welfare (Sandoe, personal comm.). The management factors considered are feeding methods, stocking rates and frequency of regrouping, use of calving boxes, allocation of colostrum and stockperson’s attitude and observational skills. These factors have been found to be significant in the maintenance of high animal welfare standards.

The agricultural press has recognised the growing interest in organic farming by publishing a number of anecdotal and descriptive reports on organic farms. These assessments tend to fluctuate between support and condemnation of organic livestock production. They are frequently based on anecdotal evidence or limited data. Some of them, however, give interesting insights into organic livestock husbandry and disease control measures (Allen, 1990; Davies, 1991; McMillan, 1993; The Independent, 1996).

Until recently, the animal health and welfare issues in organic farming have rarely been discussed by the veterinary and farming professions in public. Andrews (1991), of the Royal Veterinary College, opened the debate with his critique of organic livestock production on the grounds of animal welfare. He suggests that the stringent organic standards of veterinary care can be insufficiently flexible to cater for animals’ general well-being and challenges the Soil Association to address this issue. He also calls for a single set of carefully devised standards from which organic producers must not deviate, but which should be flexible enough to allow effective prevention of disease.

In a response to Andrews’ opinions on animal welfare and organic farming, Halliday (1991) suggests that animal health is a function of the balance of nature; beneficial microbes competing against pathogens and predators against pests. These factors are likely to influence the survival of pathogens in the environment and result in less contamination with disease-producing organisms. However, Halliday concedes that there is little scientific evidence to confirm this viewpoint except for the experience of organic farmers which suggest successful animal husbandry methods in combating disease without the help of chemotherapy, antibiotics and vaccines.

Interest in organic livestock production has, however, increased recently in the UK as the public concerns over animal welfare and food safety have grown. As a result of the BSE crisis provoked by intensive feeding practices, public opinion has shifted in favour of organic husbandry and feeding methods as a guarantee of safe and wholesome food. In the light of the above literature review, this shift seems reasonably justified.

The research on animal health and welfare in organic livestock systems seems to be heavily biased towards dairy cow health. The analysis of the results of surveys and experimental research work is mostly based on comparisons with conventional systems. The fact that most organic dairy farms, at least in the UK, are found in very limited geographic areas, is likely to bias such analysis. The low number of organic livestock producers could also bias any survey type research, and the large variation between the farms will complicate any analysis of causal relationships. These factors have been considered by Vaarst (1995) who suggests the development of descriptive epidemiological modelling as a research tool for animal health assessment and control studies on organic livestock systems.

There is a wealth of information, scientific and otherwise, on alternative treatment strategies and disease control policies, homeopathy, acupuncture, aromatherapy, ethnoveterinary medicine and the effect of feeding and husbandry strategies to improve animal health and welfare in either conventional or organic livestock production systems. This literature is considered to be outside the scope of this review.

**Results Of Questionnaire Survey**

A total of 270 questionnaires were posted and 160 questionnaires were returned. This represents a response rate of 59%. Of these, 139 (51%) were considered to useful returns in that they contained completed questionnaires. This response rate is high for a questionnaire survey and probably reflects the motivation of organic farmers and their interest in supporting scientific research into organic farming. Some of the non-usable returns were from producers who were no longer farming organically. This could have been because at the time of the study the Soil Association database of organic farms had not been recently updated.

The majority of respondents (82%) indicated that they would be prepared to co-operate with further studies. This will provide a useful database with which to develop and conduct research in the future.
The majority of respondents (72%) classified themselves as farm owners. A further 15% were farm managers whilst only 9% were farm tenants. The total farm acreage of all farms covered was 76,602 acres of which 60,435 acres were classified as being under arable cultivation. Most farms had some arable acreage reflecting the mixed farming systems practiced by the organic sector. 48,724 acres (64%) of the total acreage were in Less Favoured Areas (LFA). However, only 23% of farms were in LFAs, reflecting the extensive nature of this type of system. Most of these farms were sheep and beef enterprises.

Most respondents kept more than one species of livestock. This predominance of mixed species systems is characteristic of the organic approach to livestock production. Graph 1 indicates the breakdown of farming systems. The most common form of mixed livestock farms were those keeping beef cattle and sheep.

Graph 1. Classification of Farms by Livestock System

Table 1 summarises the number of livestock of each species covered by the survey.

Table 1. Herd/flock Size

<table>
<thead>
<tr>
<th></th>
<th>Number of Farms</th>
<th>Total Animals</th>
<th>Average Herd/Flock</th>
<th>Minimum Herd/Flock</th>
<th>Maximum Herd/Flock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>34</td>
<td>3237</td>
<td>95</td>
<td>1</td>
<td>480</td>
</tr>
<tr>
<td>Beef</td>
<td>112</td>
<td>8506</td>
<td>76</td>
<td>1</td>
<td>436</td>
</tr>
<tr>
<td>Sheep</td>
<td>90</td>
<td>35127</td>
<td>390</td>
<td>6</td>
<td>3450</td>
</tr>
<tr>
<td>Goats</td>
<td>12</td>
<td>159</td>
<td>13</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Poultry Layers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broilers</td>
<td>47</td>
<td>1984</td>
<td>42</td>
<td>2</td>
<td>400</td>
</tr>
<tr>
<td>Pigs</td>
<td>24</td>
<td>6250</td>
<td>260</td>
<td>1</td>
<td>3800</td>
</tr>
</tbody>
</table>

Table 2 includes data on the range of female breeding animals in the study herds and flocks. The mean herd/flock size gives an indication of the small scale nature of many organic farms. The range in herd/flock size is an indicator of diversity of farm size. Some systems are dedicated solely to the production of meat from purchased male stock. The average size of dairy farms is 63 milking cows. A closer examination of this data revealed that of the 34 farms milking cows, only 13 or 38% kept more than 50 milking cows. On these 13 larger farms the average size was 138, ranging from 60 to 300. The total cows in milk on these 13 farms was 1,796, 55% of the total milking cows in the survey.

An estimate of the mean size of broiler flocks is misleading as there were only 8 flocks recorded, one of which had 5000 birds accounting for 87% of the total broiler population. The average flock size of the other seven producers was only 11 birds. A similar picture was observed amongst pig producers with one farmer keeping 61% of all pigs included in the survey.

Table 2. Number of breeding females

<table>
<thead>
<tr>
<th></th>
<th>Number of Farms</th>
<th>Total Animals</th>
<th>Average Herd/Flock</th>
<th>Minimum Herd/Flock</th>
<th>Maximum Herd/Flock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy (cows)</td>
<td>34</td>
<td>2153</td>
<td>63</td>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>Beef (cows)</td>
<td>93</td>
<td>2722</td>
<td>29</td>
<td>1</td>
<td>186</td>
</tr>
<tr>
<td>Sheep (ewes)</td>
<td>89</td>
<td>20297</td>
<td>228</td>
<td>5</td>
<td>2000</td>
</tr>
<tr>
<td>Goats (does)</td>
<td>12</td>
<td>85</td>
<td>7</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Pigs (sows)</td>
<td>23</td>
<td>589</td>
<td>26</td>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>Laying hens</td>
<td>47</td>
<td>1984</td>
<td>42</td>
<td>2</td>
<td>400</td>
</tr>
</tbody>
</table>
Dairy Systems

The breeds of organically managed dairy herds are shown in Graph 2. This information only provides an indication of the proportion of each breed in the National organic herd because it was not possible from the questionnaire returns to derive exact figures. Friesian Holstein cattle appear to be the predominant breed. Channel Island breeds are also popular amongst organic producers with 26% of herds comprising Jersey or Guernsey cattle. Other indigenous breeds such as the Dairy Shorthorn and Ayrshire are also represented.

Graph 2. Breeds of Dairy Cattle

A summary of the responses related to production levels are included in Table 3. This data may be influenced by the quality of farm records and the ability of the farmer to derive the parameters correctly. However, the data does suggest that the performance indicators for the highest performing herds are comparable to those of conventional herds whilst the lowest performing herds are producing considerably less than national averages.

Assuming that the herds are being maintained at a constant size, a mean annual replacement rate of 21% indicates that on average cows are kept for approximately five years. Eighteen out of 27 responses indicated a preference for an age at first calving of 2 to 2.5 years. Only two producers aimed to calve at two years. Six farms had heifers calving at more than 2.5 years of age.

Table 3. Dairy production estimates

<table>
<thead>
<tr>
<th></th>
<th>Calving Intervals (days)</th>
<th>Replacement Rate (%)</th>
<th>Lactation Yield (litres/305days)</th>
<th>Mean Annual Cell Count (,000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of herds</td>
<td>23</td>
<td>23</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Mean</td>
<td>380</td>
<td>21</td>
<td>4950</td>
<td>231</td>
</tr>
<tr>
<td>Minimum</td>
<td>345</td>
<td>12</td>
<td>2905</td>
<td>150</td>
</tr>
<tr>
<td>Maximum</td>
<td>430</td>
<td>27</td>
<td>6400</td>
<td>350</td>
</tr>
</tbody>
</table>

Fifty two percent of dairy producers indicated that they were using a combination of artificial insemination and natural service on their cattle. A further 37% used only artificial insemination with a minority (11%) using only natural service. The use of artificial insemination is often required to maintain genetic diversity in closed herds. The majority of farmers stated that they rear all their own replacement stock. The farms were evenly divided between those that wean calves at less than one week and those that wean when calves are more than one week. A small number of producers removed calves after 12 weeks of age.

It was clear from the questionnaire returns that the decision to cull a dairy cow is often based on more than one consideration. However, the most important factors were age, infertility and mastitis history (Graph 3). Interestingly, most cull organic dairy cows are still sold to abattoirs or through markets (Graph 4). This situation will probably now change as a result of the new BSE controls introduced for older cattle.

Graph 3 Reasons for culling
Answers relating to routine use of vaccines revealed that only a minority of farmers used routine prophylactic vaccinations against lungworm (27%) or leptospirosis (19%). Only one farmer professed to using both vaccines. The majority of producers relied on clean grazing (54%) and/or mixed grazing strategies (50%) to control worms in young stock. Thirty three percent used routine anthelmintic treatments. A small minority (8%) did not use any of these strategies. 77% of dairy farmers used some form of footrot control strategy. The majority (62%) adopted foot-trimming, with a third of these also using a footbath.

The control of mastitis is an important issue on organic farms. On conventionally managed farms a five point plan has been proposed that incorporates dry cow therapy. The plan is unacceptable to organic producers as the UKROFS Standards state that "Prophylactic use of antibiotics on a herd or flock basis, such as dry cow therapy is ... prohibited". Questionnaire responses revealed that organic farmers were using a combination of antibiotics (62%) and homeopathic remedies (65%) to control mastitis. Approximately a quarter of producers were using cold water massage with 19% using uddermint. A surprising 23% and 27% were not using either of the pre-milking or post-milking teat treatments. A further analysis would be required to assess whether these are the small-scale producers who may be producing for home consumption. Based on the somatic cell count data shown in Table 6, it would appear that in many herds the mastitis control measures practiced by organic producers provide an adequate control of mastitis.

Producers were asked to rank the importance of a number of diseases on their farms. A score of 5 was used to indicate a serious problem with a score of 1 indicating that a disease or condition was not a problem. The average score for each disease was calculated. The results relating to adult dairy cows are presented in Graph 5. The highest ranking disease was mastitis. This was the only condition achieving an average ranking of 3 (a slight problem) across all the organic dairy farms surveyed. Infertility also ranked as a commonly perceived problem followed by milk fever and lameness. These are problems common in conventionally managed herds.

The low ranking given to BSE is not surprising given that the UKROFS Standards (1995) states that "diets...should not have levels of protein and energy associated with intensive production." It should be pointed out that the survey was completed before a government announcement on a possible link between BSE and CJD in humans.

Mastitis and BSE are perhaps the two disease conditions of most significance to conventional dairying. A more detailed presentation of the assessment of these by organic farmers are given in Graphs 6 and 7. These show that the assessments of each were relatively consistent between farms.
Producers were also asked to assess the diseases affecting dairy calves and replacements. A graphical presentation of these is not presented here as all conditions received a low average ranking with little difference between diseases. Generally, however, clostridial diseases were not considered to be a problem, whereas mineral deficiencies, fluke and worm infestation, summer mastitis and calf diarrhoea were perceived to be low level problems. Some conditions did receive high rankings on individual farms, but these were obviously farm specific and therefore could not be considered as a general indicator of disease events on organic farms.

Only 8% of dairy farmers admitted to not keeping milk records. It may be assumed that these were not strictly commercial producers. Of those that do keep records, most used the National Milk Records scheme.

**Beef System**

More respondents kept beef animals than any other system. Comparing these numbers with the number of dairy farms indicates that the standards set out for organic meat production are more easily achievable than those required for milk production.

A total population of 8,506 beef animals were surveyed on 112 farms. The average herd size was 76, with a wide variation between farms (Table 1). Table 4 shows the proportion of different production systems on these farms. The
The extensive nature of suckler cow production is reflected in the data for breeding practices. The majority of producers (85%) used natural service on their cattle. Of these, 30% also used A.I. The majority of cattle are wintered either in loose-housing or outside.

Many organic beef farms also keep sheep. These mixed grazing systems provide an ideal opportunity to use clean or mixed grazing strategies to control internal parasites. The survey revealed that the majority used one or both of these strategies. 30% of producers use anthelmintics, most using them in conjunction with controlled grazing practices (Graph 8).

The UKROFS Standards state "livestock systems ... should be planned to make the maximum use of grazing". This is apparently the case with many organic beef producers. The majority of suckler cow producers do not feed concentrates to their cows (76%) or to calves (61%). Suckler cow production is frequently characterised by small gross margins per cow whereas the premium on organically grown concentrates is high. Given this situation it is hardly surprising that concentrate use is not common. Even when concentrates are used they must be predominantly of organic origin and not contain any ruminant protein.

Marketing methods have important animal welfare implications in that the distance travelled and the number of journeys made have a direct effect on stress levels imposed on livestock. The welfare of animals during transportation is clearly emphasised in the UKROFS standards. This study revealed that most farmers (58%) sell some of their beef through organic outlets (Graph 9). This presumably ensures that cattle achieve a premium sale price as a consequence of being organically reared.
The survey also indicated many farmers used more than one method of marketing beef. It should be noted that some producers commented on the limited number and the distant location of organic outlets or desirable abattoirs and the fact that this makes it impossible for all animals to be sold through these outlets. This may explain why 31% of farmers sold at least some of their livestock through traditional cattle auctions. A number of comments were also made with regard to the need for mobile abattoirs and their potential impact on the stress levels of animals going for slaughter.

With regards to health control policies, only a minority of farmers used routine prophylactic vaccinations which is similar to the strategies adopted by organic dairy farmers. Indications were that mastitis was generally not a significant problem (Graph 10) although there was some variation between farms. A wide range of mastitis control strategies were adopted when the problem did arise. This result is hardly surprising given that suckler cow systems are largely managed extensively using low milk yielding breeds.

Graph 10 Disease Problem Rating for Adult Beef Cattle

Graph 11 Disease Problem Rating for Beef Calves And Followers

Generally, animal health issues amongst adult and young stock were not given high problem rankings (Graphs 10 and 11). Infertility and calving difficulties were considered the most important amongst suckler herds. External parasites, diarrhoea and mineral deficiencies, although receiving low rankings, were considered the most important conditions in young, growing stock.
Ninety sheep producers responded to the questionnaire. The majority of these were situated in the lowlands (64%), 19% were classified as upland and 11% as hill flocks. Six percent were classed as a mixture of these three categories. The respondent farms can be divided into three approximately equal sized groups with regards to whether ewes were lambed indoors, outdoors or both. Most flocks were wintered outdoors.

Given the variation in location of flocks, it is hardly surprising that there was also great diversity in the breed of sheep kept and the production levels achieved (Table 5). This data gives an indication that organic farms are represented at all levels of the stratified British sheep system.

Table 5 Sheep Production Rates

<table>
<thead>
<tr>
<th></th>
<th>Ewe replacement rate (%)</th>
<th>Lambing percentage (%)</th>
<th>Lamb mortality rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of farms</td>
<td>56</td>
<td>75</td>
<td>67</td>
</tr>
<tr>
<td>Mean</td>
<td>18</td>
<td>157</td>
<td>5.72</td>
</tr>
<tr>
<td>Minimum</td>
<td>3</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td>Maximum</td>
<td>40</td>
<td>200</td>
<td>33.33</td>
</tr>
</tbody>
</table>

Most farms used a range of outlets to sell lambs, with the most common destinations being direct abattoir sales (38%) and livestock auctions (32%), 21% used farm shops and 28% used other not specified methods. It seems apparent that a proportion of lambs reared on organic farms are sold for premium prices through organic outlets, whilst the remainder are sold through conventional markets. Cull ewes are also generally sold through traditional auction yards (62%). It seems likely that the demand for organic sheep meat is limited largely to prime lamb. The limited number of organic outlets may also be an issue dictating marketing strategies.

Organic sheep farmers seem to be more reliant on vaccination and deworming than organic dairy and beef farmers. 41% vaccinated against clostridial diseases and 28% against pasteurella. A number of these (24%) used both vaccination regimes. This indicates clearly that organic sheep farmers adopt health “insurance policies” as do conventional farmers.

As with the organic beef systems, the majority of sheep farms are apparently using anthelmintics, to varying degrees, as part of their internal parasite control (64%). Many of these were using anthelmintics with other methods. Only 9% used de-wormers only. 69% used clean grazing practices and 55% mixed grazing. A proportion were obviously using a combination. Six percent of farmers were using homeopathic remedies to control worms. The use of garlic was common amongst these. Only 2% responded that they did not have a control policy. Almost half of organic farmers (48%) either used anthelmintics on lambs infrequently or never. 32% wormed every 3-6 months, whilst 12% wormed every two months and 8% wormed every month.

Most of the organic sheep farmers that completed the questionnaire did not use chemicals to control sheep scab and even those that do use chemicals rely more on synthetic pyrethroids than organophosphate dips (Graph 12). The UKROFS Standards state that sheep dipped using organophosphorus (OP) compounds, in compliance with Statutory requirements, must be permanently marked at the time of treatment. Such animals must not be used for organic meat production. The need to ban the use of sheep of OP dips was commented upon by a number of respondents.

Graph 12 Techniques Used To Control Sheep Scab In Organic Sheep Flocks

Footrot was perceived to be the most important condition afflicting adult sheep (Graph 13). The disease receiving a ranking of 2.7, indicating that it was a problem on a number of farms. 27% perceived this as a continuous problem. The majority use either footbaths, foot trimming or both as control. Antibiotics are not widely used to treat the condition. Mastitis, fly strike and fluke and worms were generally considered to be slight problems.
Of the diseases afflicting lambs fly strike, worms and footrot received the highest rankings, although again, overall, these were seen as slight problems (Graph 13). 11% did, however, regard fly strike as a continuous problem and 8% gave worms a similar ranking. The problem of fly strike is mainly tackled by a combination of the use of Vetrazin and management techniques such as dagging.

Graph 14 Summary Of Disease Problem Rating For Lambs

Only 159 organic goats were covered by the survey. This represents too small a sample to draw any real conclusions with regards to their management and health status.

Pig Systems

Only 24 organic pig farmers with a total of 6,250 pigs responded to the questionnaire. More than half of these were kept on one farm. Most of the herds were classified as mixed breeding and fattening units with pigs predominately housed outdoors in arcs. The main output from these farms were porkers and baconers for slaughter.

The data reflecting disease perception were characterised by a general low ranking given to all conditions. Lice infestation was the only condition given a mean ranking of more than 2 indicating that this was a slight problem overall. Questions on animal health control focused on vaccination policies, the use of dewormers and iron injections and the treatment of mange. Overall, the trend was of low chemotherapy and chemoprophylactic treatments.

The main conclusion that can be drawn from the survey of pig producers is that most units are small scale with low veterinary requirements. The additional cost of labour required to operate organic pig units may be considered to be restricting the number of producers. This point was raised during key informant interviews.

Poultry Systems

Forty seven respondents indicated that they kept laying hens. Eight producers indicated that they kept broilers. The average laying flock size was 42 hens. However, only 22 of these responded to the poultry questionnaire of which only 2 were broiler producers. It is presumed that the remainder felt that their systems were largely aimed at home consumption and the flocks were too small to justify inclusion in the more detailed questionnaire page. Therefore, only a limited analysis of organic poultry was possible. Only 5 farmers were able to provide an indication of the performance of organic laying flocks. Of these, the average production per bird per year was 230 eggs.

Low disease rankings and veterinary inputs were recorded. As with pig production, the additional costs of organic production, particularly the price of organically grown cereals, may be restricting the number of large scale commercial producers.
Producer Comments

105 respondents completed the comments page. The comments were wide ranging and frequently informative. As a result of the diversity of response, preparing analysis was not easy. However, definite trends were observed in the types of comments given and these are summarised here. The results of the analyses are expressed as a percentage of the total notable comments made in each category.

Animal health and welfare problems not covered in this questionnaire which you feel are important.

17 producers felt that the lack of local abattoir facilities, stress caused by slaughter and/or the need to transport their animals for long distances were major animal welfare constraints. Comments by 14 respondents pointed out the importance of good management, welfare-friendly housing systems and appropriate feeding regimes as major factors affecting animal health. It was felt that these aspects were not adequately emphasised in the questionnaire. Also, the significance of closed herd management in disease control was pointed out by 4 producers. Mineral and trace element deficiencies were also considered important.

"The only journey sheep should make in their life is the journey to the local abattoir for slaughter."

"Animals are the same as humans, plants and machines - if not put under stress, you get very few problems."

"I feel that the experience and training of staff, the number of people involved and the quality and convenience of handling facilities are very important factors in relation to animal health and welfare."

Additional health and welfare issues % of responses

Abattoir and/or transport stress 21
Management and housing 17
Mineral and trace element deficiencies 7
The significance of closed herd policies 5

Areas of organic livestock production that would require further scientific research.

Various aspects of animal breeding: indigenous breeds, breeding for disease resistance, optimum breeds for organic systems and the semen quality in organic bulls provoked most comments on further research (19). Breeding for disease resistance was seen as a major contribution towards better animal health by 9 respondents. There were also several comments on the need to identify an optimum dairy cow breed under the organic conditions.

"Reduction of disease can be achieved by sustainable breeds - correct choice of breed in relation to resources of the farm."

"Organic farmers should be deterred from using Holstein cattle!"

Homeopathy was also identified as an area in need of further research (15 comments). Several comments pointed out the lack of available advice on homeopathy and other alternative treatments and therapies. Some respondents felt that scientific research into the efficacy of homeopathic remedies would encourage the veterinary profession to take up this type of therapy with greater enthusiasm than is the case at the moment.

"We need some good trials [with homeopathic remedies] to show their efficacy to convert the sceptics."

"There is a lack of support and training even for vets who would like to work with homeopathy."

"We could do with another book on homeopathy for cows. The existing books are not very user-friendly."

Further research on animal feeding according to organic standards, mineral deficiencies, internal parasite control in sheep and cattle and housing stress were all supported by several comments. General, long-term animal health monitoring on organic farms was suggested by some respondents to convince the producers who felt that animal health issues were the biggest deterrents to conversion.

Further research needed % of responses

BREEDS AND BREEDING (INCLUDING DISEASE RESISTANCE) 17
Homeopathy 13
Internal parasite control 9
WELFARE FRIENDLY HOUSING SYSTEMS 8
Mineral deficiencies 7
Pasture management issues 6
Feeding (forage and concentrates) 6
Flystrike/scab control 5
Animal welfare and ethology 5
Mixed/clean grazing 4
Animal health monitoring on organic farms 4

Other research issues receiving two or more comments were stocking rates, the BSE and CJD link, closed herds, longevity/culling and mastitis.

Aspects of organic livestock production which could be adopted by conventional livestock producers.

A total of 21 respondents considered mixed and/or clean grazing as the aspect of organic farming most suitable to be adopted by the conventional sector. Twelve comments also suggested the adoption of homeopathy more widely in livestock production. Lower stocking rates, use of clover and legumes and a wholesale adoption of all organic practices were also common suggestions. Some organic producers, however, considered the “pick and mix” approach unacceptable and felt that the organic husbandry systems work best as entities where one aspect supports the other.

Organic practices seen as suitable for % of responses
the conventional sector
Mixed/clean grazing 21
Homeopathy 12
Lower stocking rates 11
Use of clover/legumes 10
All organic practices 8
Reduced dependency on anthelmintic/antibiotics 7

Other areas recommended for wider adoption within livestock production were better welfare practices, closed herd policies, non-use of OP-dips, less intensive feeding practices for dairy cows and better awareness of mineral requirements.

Any other comments that you might have.

The comments received here were too diverse to analyse. They were informative, frequently philosophical and occasionally contradictory and critical. Of the latter, a requirement for increased flexibility in organic standards was noted, particularly since there is a great diversity between farms. Some made the comment that the rigidity of the animal health control standards were counter-productive in terms of improving animal welfare. Examples given were dry cow therapy and worm control. On the positive side, many respondents took the opportunity to express their delight in the health and welfare of their livestock.

A number of comment were also made with respect to the requirement for government support to organic farming, both for conversion and in pricing-subsidies. A number of respondents raised the issue of the over-commercialisation of drug manufacturing industry and the negative impact that has on conventional systems. The need for greater community awareness and participation in agriculture and the requirement for environmentally sensitive practices were also commented upon.

"On the whole, we have very little in the way of health problems."
"Our animals are surprisingly healthy."
"We stopped worming in 1981 and have experienced no problems at all since then."
"I have not wormed any ewes for 5 years and only 1 batch of cattle during that period."
"[There is] a need for clarification of organic standards - to be more farmer friendly in terms of use of language and interpretation of input products."
"Use of OP dips could easily be banned - there are plenty of alternatives."
"There should certainly be more help for organic farmers from the community. It would help cut overproduction, help health in stock and benefit the environment."

DISCUSSION

This study has focused on monitoring animal health and welfare in organic farming systems with a view to identifying research priorities. This discussion will summarise these findings and place them in the context of the relevant
It was clear from the outset that there was a dearth of scientific information concerning organic livestock production. The lack of reliable sources of information concerning the details of organic production has often resulted in a situation where the public, farmers, scientists and politicians have failed to grasp the true significance and implications of organic techniques. This has meant that many farmers fear that converting to organic production might leave their herds vulnerable to disease. The feeling that organic production could not feed the nation or that it is "uneconomic" have also been expressed. It is therefore of great importance to promote further research in this field, not only to identify the real benefits of this approach, but also to alert farmers to some of the possible pitfalls.

The subjective assessment of disease adopted in the survey is limited in its value as an indicator of disease incidence and impact. Variations in farmer perception of disease are bound to occur between farms and diseases. Differences in the seasonality, mortality rates and production losses associated with diseases will influence perception. However, it is felt that the qualitative methods applied can be useful in exploratory studies of this type, where research objectives are sought.

Given the limitations of this study, it was still clear that organic farmers in general did not perceive animal health and welfare issues as a significant problem. It is interesting to note that the most significant disease problems identified by organic farmers are not that different to disease problems in conventional systems. However, unlike conventional farms, organic producers seemed to be able to control these diseases by a combination of sound management practices and occasional chemotherapy.

Overall, it is apparent that organic producers consider animal disease levels on their farms to be low. It is unclear from this study whether specific strategies, such as low stocking rates, mixed species systems, homeopathic remedies, reduced housing stress, etc. are responsible for this situation, or whether the overall organic approach is most important. Comments from producers vary in their assessment of why their livestock are apparently healthy. Again, it is unclear, without a comparative epidemiological study, whether disease levels are any lower than those seen in other farming systems.

The producers surveyed cited lower stocking rates, clean or mixed grazing strategies, the use of homeopathy, attention to mineral deficiencies and the reduction of stress as the most important components of their systems that should be adopted by conventional producers. The production, economic and health impact of the uptake of these strategies requires further investigation. The impact on the national economy and food supply is a question frequently asked. Answers are required.

Homeopathic remedies are commonly used to control a range of diseases. Many organic producers believe that this is a strategy that should be adopted more widely by the farming community. Reports of the success of homeopathic remedies are frequently anecdotal. There appear to be an equal number of cases where homeopathy has not been effective. There have been very few scientific studies on homeopathy. This situation has contributed to the poor general understanding of these remedies. Controlled trials are required to test the efficacy of the various 'alternative' treatments. A number of producers commented that they would like more practical information on homeopathy and veterinarians who were trained in its use.

Many of the comments received from organic farmers were concerned with welfare issues, such as stress related to housing and during transport. Despite this concern, a large number of producers still sent cull animals to livestock markets, due to the poor organic market for culled animals. The need for more mobile abattoirs and a return to a less centralised abattoir industry appears as a major concern of organic producers. Although well established epidemiological tools exist to assess the incidence of livestock diseases, evaluating stress caused by the farm management system is a more complex issue. Quantitative measures such as housing density, activity periods, etc. can be applied. However, these do not necessarily indicate levels of physiological stress.

Although a fundamental component of the organic philosophy relates to the avoidance of animal suffering, there was a feeling amongst some respondents that the rigidity of some of the organic standards has a negative impact on welfare. The restrictions on the use of routine anthelmintic treatments, and dry cow therapy in the control of mastitis, are good examples of this. A sufficient degree of flexibility in the standards of any organic classification is required to accommodate these issues. In fact, the Soil Association (1989) state "if, despite appropriate and human husbandry, animals fall ill and drug use is deemed necessary, it must not be withheld."

The concern raised in some quarters that organic production is not animal welfare friendly does not seem to be borne out in the preliminary findings of this study. Further work to monitor welfare standards, using the welfare indexes developed in Germany as a model, could be carried out on organic farms. In particular, the problems associated with transport, marketing and slaughter of organic livestock needs to be examined in more depth. However, it should be emphasised that animal welfare problems in many conventional systems are of far greater concern than the limited problems found in organic systems and would appear to be more in need of further research.

Research in the future is needed to quantify the diseases and control measures that are considered to be important and to assess their relative impact in terms of effects on production, welfare and economics. Studies of this type would be most appropriate if evaluated in terms of the impact on the farming system as a whole. Comparisons with other, more conventional systems would be useful if the development of transferable control strategies was an objective. The allocation of long term funding for this applied research should be a priority at both a national and European level.

The growing consumer awareness and interest in organic foods has not been fully met by the supply from British organic producers. This has led to a situation where Britain has had to import significant quantities of organic produce in order to fill the supermarket shelves. The problem is compounded by the fact that organic production remains small-scale and peripheral to the main agricultural economy and as a consequence organic produce frequently carries a significant price premium. This in turn serves to discourage consumers from purchasing organic products, and thus fails to provide sufficient incentive for farmers to convert to an organic approach.

There appears to be a wide gulf in British farming circles between the small core of committed organic producers and the main body of farming opinion. This alienation of the organic movement has resulted in a good deal of ignorance among conventional farmers, scientists and the media about what is involved in organic production. There is a need to keep all interested parties informed and involved in the developing understanding of organic approaches and alternative techniques. This could achieved through further applied research, publication of scientific findings and the organisation of seminars and workshops for farmers, vets, scientists and other interested groups. The new MAFF
The numerous quality assurance schemes that have sprung up recently have failed to bridge the gap between the organic and conventional groups and have in some cases simply served as an easy option for farmers. For organic techniques to take root and gain wider acceptance, it is important that the consumer and the main retailers are made aware of the significance of organic products, while farmers must become more aware of the potential of organic production. Organic farming will need to be able to supply the quantity and quality of organic products required to satisfy consumer and marketing requirements.

In order to encourage farmers to move towards more sustainable and environmentally friendly practices, it is important to facilitate the process. In some ways economic incentives may prove the key, but it is also necessary to make any conversion process as easy as possible. Of particular concern to many farmers is the risk involved in moving from a system which relies heavily on chemotherapy and chemoprophylaxis for disease control to a system which places more emphasis on management and husbandry techniques to achieve the same purpose. This is an area where more scientific research is required in order to provide all the relevant advice to farmers.

Economic assessment of organic production and agricultural policy must recognise that the economic and policy environment provided by the Common Agricultural Policy (CAP) is not the only option and does not necessarily result in optimal resource allocation. It is quite possible that future changes in the CAP will produce an entirely different economic climate for organic production methods.

The recent crisis over BSE has served to underline the risks associated with many conventional farming practices. It is no longer sufficient to adopt new techniques simply because they guarantee greater profit margins or higher production. In future it will be essential to examine all the possible outcomes of these new approaches. The opinion of the consumer must also be taken into account in order to avoid any future crisis of confidence which has been shown to cause enormous damage to the farming industry as a whole.

Organic farming offers a number of approaches which may be best adapted to the more sustainable systems required for the future. The opinion of the consumer is that this incentive is too difficult to police the standards as more farmers convert. There will be increased costs as well as increased costs as well as non-renewable resources. The problems of limited supplies of fossil fuels and nitrates are certain to necessarily result in the organic sector. Some of the organic mastitis study at the University of Reading provides an example of how these ideas can be put into practice.

Implementation of on-farm epidemiological and economic monitoring systems. In order to encourage farmers to move towards more sustainable and environmentally friendly practices, it is important to facilitate the process. In some ways economic incentives may prove the key, but it is also necessary to make any conversion process as easy as possible. Of particular concern to many farmers is the risk involved in moving from a system which relies heavily on chemotherapy and chemoprophylaxis for disease control to a system which places more emphasis on management and husbandry techniques to achieve the same purpose. This is an area where more scientific research is required in order to provide all the relevant advice to farmers.

Economic assessment of organic production and agricultural policy must recognise that the economic and policy environment provided by the Common Agricultural Policy (CAP) is not the only option and does not necessarily result in optimal resource allocation. It is quite possible that future changes in the CAP will produce an entirely different economic climate for organic production methods.

The recent crisis over BSE has served to underline the risks associated with many conventional farming practices. It is no longer sufficient to adopt new techniques simply because they guarantee greater profit margins or higher production. In future it will be essential to examine all the possible outcomes of these new approaches. The opinion of the consumer must also be taken into account in order to avoid any future crisis of confidence which has been shown to cause enormous damage to the farming industry as a whole.

Organic farms exist in a wide range of sizes and environments. Applying standards to such diversity will obviously create problems, in that not all situations can be catered for. As an example, a large farm is more likely to be able to apply clean grazing policies for internal parasite control than a smaller unit with limited resources. It is fortunate that organic farming policy makers have accepted the dynamic, complex and diverse nature of this system of production, and frequently review and update many of the standards.

Recent, the UK Government has offered financial support, through the Organic Aid Scheme, for conversion to organic farming. A general feeling amongst the farming community is that this incentive is too small to compensate for the loss in income the three-year conversion period. During conversion, produce cannot be sold at an organic premium. A call for improved subsidies is frequently made by the organic associations. The need for compensation during the conversion period, and price subsidies on the products, are frequently the focus of this lobbying. The role of the European Union through the CAP is seen by some as fundamental to the support and widespread adoption of organic practices.

An examination of the more advanced status of organic farming in some European countries is necessary if similar patterns of production are to be achieved in the UK. Austria, Germany and a number of Scandinavian countries have recently seen the widespread adoption of organic farming. Lampkin (1994) relates this dynamism to the introduction of conversion subsidies. The practices and policies at farmer and national levels should be examined. International collaboration between research institutes and producer organisations would have obvious benefits in terms of the development of organic farming.

It is envisaged by many that organic farming will become more widespread in the UK during the coming decade. It will become increasingly difficult to police the standards as more farmers convert. There will be increased costs as well as infrastructural and institutional problems. A situation is bound to occur where conventional farmers convert largely for commercial reasons. This will result in a greater need for policing, as philosophical belief in the system, and the commitment that goes with this, will not be sufficient to allow self regulation. Given this scenario, it would seem likely that standards will need to be changed, possibly with additional flexibility, or perhaps even a two-tier classification.

In summary, organic farming offers a number of approaches which may help to move agriculture away from its current dependence on non-renewable resources. The problems of limited supplies of fossil fuels and nitrates are certain to influence the types of agricultural production that can be sustained in the coming millennium. The danger is that the highly sophisticated animal and plant genetic stock that has been developed to maximise production under current conditions may not be best adapted to the more sustainable systems required for the future. It is therefore of great importance that research be implemented at this stage to ensure that we have the appropriate technologies available for the systems that will be required by future generations.

RECOMMENDATIONS

This study has identified a number of areas in which further research is required in the organic sector. Some of the general recommendations for future research are listed below:

- Studies on organic livestock production should place emphasis on dairy, pig and poultry rather than grass-based beef and sheep systems.
- Further epidemiological studies quantifying levels of disease in organic livestock systems are required.
- Implementation of on-farm epidemiological and economic monitoring studies to assess the benefits of common
health control strategies on organic farms.
- Development of animal health extension and training programmes for organic farmers particularly those in, or contemplating, conversion.
- Development of training programmes and extension for veterinarians in organic animal health and welfare practices.
- Macro-economic studies on the role of organic farming in the UK.
- The development of health, production and economic indicators that incorporate the integrated, whole farm approach of organic farming.
- Investigation of the transferability of organic animal health strategies to the conventional sector.
- Studies into the feasibility of developing a "second tier" of farming standards for those not wishing to fully convert to present organic standards but wishing to operate low input systems, including an assessment of present quality assurance schemes.
- Further investigation into breed selection for disease resistance and suitability for organic systems. In particular studies of the genetic merits of some of the traditional livestock breeds is required.

In addition to the general research pointers, the following list details some specific research topics which have already been identified as areas for further study:

- Control of mastitis in organic dairy herds;
- Ectoparasite control in sheep including fly strike and sheep scab;
- Transmission of BSE in organic beef and dairy herds;
- Efficacy of homeopathic remedies for all livestock;
- Mineral and trace element deficiencies in cattle and sheep;
- Welfare issues relating to transport of slaughter stock to abattoirs;
- Behavioural studies and other health and welfare issues associated with the conversion of pig and poultry units.

**REFERENCES**


Zealand Veterinary Association.


UKROFS (1995) UKROFS Standards for Organic Food Production


