Session 11

Animal welfare and environmetal impact of meat production and processing

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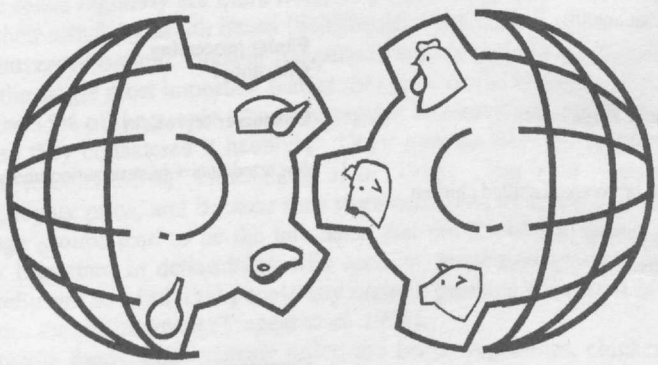

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CONSUMER CONCERNS

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This paper examines some of the food scares that have occurred during the past forty years. It looks at why food scares have become increasingly common, and why some countries are particularly affected. It then considers food buyers' attitudes towards food safety, environmental issues, animal welfare, organic foods, and genetically modified foods, and the impact that those attitudes have had on food choice. It finishes with some thoughts on how food labelling and WTO measures could change in the future.

Food Scares

Food Scares have been quite common in countries such as Britain. Whereas in New Zealand, where there is a relatively high incidence of reported food borne diseases, Food Scares have been almost non-existent. In the USA, Food Scares have been relatively infrequent, and this may be because the public is continually reminded about food-associated risks through health warnings that are carried on labels. This helps to reduce over-reaction when a Food Scare threatens. In Britain there has sometimes been over-reaction during a Food Scare, perhaps because there has been limited authoritative information that could have lessened peoples' concerns about the imagined hazards.

In recent years, some nations have been losing trust in the authorities that are notionally responsible for food safety. For example, in 1965, 98% of the people in Pennsylvania thought that the government adequately regulated pesticides. By 1984, that number had fallen to 46% (Dittus and Hillers 1993). Since that time there has been greater emphasis on the food industry managing and monitoring food safety standards through Standard Operating Procedures or Risk Management Programs. With the move away from regulatory body enforcement, the image of Governments as controllers of risk situations has declined further. Public trust stems from the belief that the food authorities and the food industries, put the safety of the consumer above other considerations. Food safety in the USA is regulated by the FDA, which acts as an independent body with no links to producers, whereas in the UK food safety is monitored by MAFF, which historically has protected the interests of the farming and food industries. The FDA probably enjoys more public trust than MAFF because of its independence. That trust helps to reduce the public's perception of the size of a hazard.

The decline in public confidence has been associated with an increase in the frequency of Food Scares (Table 1). Some recent incidents, such as BSE, have had international repercussions, and this has heightened the awareness about food safety globally. In the past, microorganisms have featured strongly in Food Scares, but since the mid 1980s there has been a broader range of causes. Now, over 30% of the Food Scares are connected in some way with either new technology, environmental pollution or changes in co-product management. The food additives incident in the mid 1980s was one of the first major issues in Britain that did not involve a microorganism. The concern about food additives, and in particular food colourants, grew from increased awareness about their use and their side effects. For example, it was estimated that the average annual consumption of food additives was 5 kg per person. Heightened concern lead to consumer pressure in the form of letters to supermarkets. At the same time the EEC was plann-

Table 1. Food Scares in the UK, 1960-1999. Scares given in bold type had a particular impact.

1960	Food poisoning from re-warming cooked meats	
1964	**Typhoid Fever**	**Imported corned beef**
1968	Algal toxin in mussels	
1970	Mercury in fish	
1976	Food poisoning from cockles	
1977	Hospital meals	Kitchen hygiene
1978	**Botulism from tinned salmon**	**Imported**
1979	Mercury in oranges	Consumer terrorism
	Food poisoning – corned beef	Imported
1980	Hormone residues in veal and beef	Scare that spread from central Europe
1981	Salmonella in chicken and milk	
1984	Salmonella in chicken products	
1985	**Food additives** (e.g. tartrazine, amaranth)	
	Salmonella in dairy products	**Faulty processing**
1986	**Radioactivity in lamb**	**Chernobyl**
1989	**Salmonella in eggs**	
	Contaminants in a wide range of foods	**Consumer terrorism**
	Alar in apples	
	Botulinum in hazlenut yoghurt	Imported nuts + pasteurization under vacuum
	Listeria in soft cheeses, pâté and pre-cooked chilled chicken	
	Salmonella in poultry meat	
	Bovine brains (as vector of BSE)	
1990	Algal toxin in crab meat and mussels	
	BSE and beef	
	Carcinogens in cling film	
1991	BSE and beef	
	Contaminants in foods	Consumer terrorism
1992	Botulinum in pork	
1993	Carcinogen in apple juice	
1994	**BSE and beef**	
1995	**BSE and beef**	
	Listeria in soft cheeses	
1996	**E. coli 0157**	
	Encephalopathy from eating sheep meat	
1997	E. coli 0157 in meat	
	BSE in beef	
1998	E. coli 0157	
1999	**Genetically Modified Foods**	

ing the introduction of E number identification for food additives. The supermarkets reacted by scaling down the number of own-brand products containing about 50 additives that were giving concern, and the food manufacturing industry responded by reverting to natural food colourants.

The Food Scare situation in Britain reached a climax in 1989. Food poisoning cases were at record levels with more than 2,500 people seeking medical treatment in one week during August. However, part of the concern was generated by the media; doctors recognised that there was often a sudden filling of their surgeries the morning after a television programme on health or food safety.

Table 2 gives a breakdown of the primary concerns about food risks in the USA during the late 1980s. At that time, chemical residues were the foremost concern, but since then the leading position has probably been taken over by bacterial contamination (Hoban 1997). Concern about cholesterol exists mainly amongst the elderly, and concern about food irradiation has been a concern in the past mainly amongst people who have received less education. The only Food Scares that have been linked to Animal Welfare have been due to product sabotage by Animal Rights activists.

Consumer terrorism

Food Scares that were caused by consumer terrorism became fashionable in the 1980s. Typically, the activist or saboteur introduced a harmful substance into the product and then notified the media that the product was affected. The reasons for product sabotage have included political activism, extortion, employee dissatisfaction, copycat behaviour, and Animal Rights protest. The tamperers depended on publicity to fulfil their purpose, and the manufacturers and retailers depended on publicity to protect the public and their reputations. The guaranteed publicity helped to proliferate this type of food scare.

Consumer terrorism developed late in the UK in comparison with the USA and Japan, and it reached a height in Britain in 1989. A particularly serious incident involved a babyfood product. 100 million jars worth £32 million were taken off shelves and another 60 million were repackaged, because customers were finding glass, pins and caustic soda in the product. Meat and meat products have not been major targets for this type of sabotage, except for occasional incidents when turkey products and hamburgers have been laced with mercury. There have been three important outcomes from this period of product sabotage. Firstly, there was the introduction of extortion insurance, which has been taken out during periods of high risk. Secondly, it has emphasised the value of traceability through product labelling, and thirdly it accelerated the development of tamper-proof and tamper-evident packaging. Tamper-evident packaging has not been used much for fresh meats, and these products are now at a relatively higher level of risk.

Organic Foods

The food safety scares of the 1980s helped to direct consumers' attention towards Organic and Health foods. Demand for Organic foods increased during the late 1990s. For example, in Sainsbury's, organic foods increased from 42 products in 1996 to 400 products in 1999 and sales of 2 million per week. The total UK market is probably now worth about 440 million, and in Germany it is worth substantially more. There will be a limit in the growth of this market, as not everyone will turn to organically grown goods. The decision to change is based on value orientation. Gunter and Furnham (1992) described people's value orientation as being of two types: "Internal" or "External". Internally oriented people consider that their own destiny is up to themselves. They regard events that happen to them as due to their own efforts and abilities, and they tend to want to control their own lives as much as possible. Whereas, Externals are more likely to attribute events to chance or to decisions made by other people who are in control, and they are prone to letting fate control their lives. Homer and Kahle (1988) found that internally oriented people were more concerned about nutrition and food additives, and were more likely to be natural food shoppers. People who rarely purchased natural foods were externally oriented. Value orientation was more strongly linked to attitude than to behaviour. However, attitude towards nutrition was linked to natural food shopping behaviour. This implies that attitude acts as a key intermediate between value orientation and behaviour.

The distinction between Internals and Externals is useful, because it helps us recognise whether information that is put forward about food safety and environmental issues is likely to be accepted. The Externals are more likely to take notice of conciliatory messages, whereas Internals are more likely to respond to information (including marketing slogans) that portrays some personal benefit. Clearly, a single message is not going to appeal to everyone.

Although people who buy organic foods regularly are more likely to be internally than externally oriented, they sometimes claim that they are less often occupied in their minds by health issues (Schifferstein and Oude Ophuis 1998). Health, however, seems to be more important amongst incidental buyers of organic foods in comparison with heavy buyers (Schifferstein and Oude Ophuis 1998).

Food safety is usually considered the single most important feature that governs the selection of organic foods (Table 3). A survey in Northern Ireland showed that of the 35% of the people who were regular buyers of organic foods, 73% said that their main reason for buying organic food was because they considered it healthier. Other reasons were no additives or sprays (50%), taste (35%), freshness (34%), and environmental reasons (33%) (Titherington *et al.* 1996). The main reasons that more people did not buy organic food were poor availability, higher price, and because they were perceived as being "no better than conventional products" (Jolly *et al.* 1989). The greenest age groups tend to be the late teens and the 35-44 age group. Within the younger age group, disposable income was particularly important in determining who actually purchased green products (Titherington *et al.* 1996). Supermarket managers seem to be reluctant to admit that people buy organic produce because it is healthier. Instead, the managers say that it is because of concerns about the environment (Tregear *et al.* 1994).

The most frequently purchased organic foods, in decreasing order, are fruits, vegetables, chicken, eggs, beef, and pork products. Organic fruits, vegetables and eggs yielded higher levels of satisfaction than organic chicken, beef and pork. The reason for the greater dissatisfaction with chicken and pork was the poorer appearance or presentation of the product, and, in the case of beef, its flavour. This may have been due to more grassy flavours in comparison with beef from conventional feedlots.

Three factors are causing some farmers to take up organic meat production:

- in some countries, farmers are being forced by law to move nearer to organic systems through regulations on pollution. This has enabled compliance with organic meat production systems
- the potential for higher financial returns makes organic production more attractive, especially in saturated conventional markets, and for small scale producers. During the BSE Food Scare in the UK, beef sales dropped dramatically, and sales of conservation

Table 2. Primary concerns amongst consumers in California about food risk components (Jolly *et al.* 1989)

Food risk component	% of respondents saying they were concerned
Residues	62.3
Irradiation	60.0
Fat	51.9
Additives and preservatives	45.2
Salt	44.0
Cholesterol	42.5
Sugar	41.0
Fibre	35.5
Artificial colouring	33.7

Table 3. Important features attached to Organic Foods. Order of importance amongst consumers of organic foods (Jolly *et al.* 1989)

Feature
Safety
Freshness
General health benefits
Nutritional value
Effect on the environment
Flavour
General appearance of the product

Table 4. Reasons for concern about eating GM dairy and meat products within Japan and New Zealand

	% of those expressing concern			
	JAPAN		NEW ZEALAND	
	Dairy	Meat	Dairy	Meat
Number of people who expressed concern	260	278	871	981
REASON FOR CONCERN:				
Unknown health effects or risks	18	18	22	21
Unnatural feeling (including taste)	14	16	26	27
Doubts about safety (needs to be tested properly)	12	11	12	9
Don't know what we are consuming	1	1	14	15
Information is being hidden	7	7	11	9
Side effects	4	4	7	5
Quality and purity cannot be guaranteed	3	2	3	4
Potential for new diseases	3	4	3	3
Environment or ecological effects	2	1	-	-
Economic, ethical or political concerns	2	2	-	-

grade meat sold by the Real Meat Company doubled in the first few weeks. Organically reared meat was regarded as a safe and healthy eating option in this situation

- a belief in the organic ethic.

Health Foods

An important consequence of the Food Scare era in Britain of the late 1980s, was the rapid increase in demand for health foods. The Horticulture industry enjoyed some major benefits. Meat, on the other hand, did not, and it still does not have the image of a health food. It is, however, often regarded as good for health. At present, fish has the strongest image as a good-for-health meat, but in the past veal and chicken held that position and were often provided for invalids or people in poor health, because they were easily digested. Clearly, perceptions about health foods change with time. Another example of such a change has occurred in the case of Kellogg's Cornflakes. When first introduced this product was promoted as a health food. Now it has been displaced from that position by higher fibre less digestible cereals. In the future people may focus on eating according to their genes or personal health risk. One example is eating according to personal blood type. People with Type B or O blood groups tend to have a metabolism best suited to eating meat, and they may be advised to restrict their intake of wheat, pulses and beans to avoid getting fat, as they tend to have low stomach acid production.

Animal Welfare

Concerns about animal welfare and animal slaughter have been important contributors towards reduced meat eating (Gregory 1997). However, the link between those concerns or attitudes and behaviour are sometimes obscure. This is particularly true when there is a conflict between animal welfare and other perceived benefits, such as convenience, eating quality and price. Wandel and Bugge (1997) concluded that the majority of people are particularly reluctant to sacrifice taste, freshness and nutritional value for environmental or welfare benefits. There is bound to be a price threshold for animal welfare and environmentally sound products. That threshold will vary between socio-economic groups, and according to outlook and prospects. In the case of Norway, people claim that the threshold lies between 5 and 10% above the price for standard product. However, that claim has not been reflected in their behaviour. What they said was an exaggeration of their willingness to pay more.

Oude Ophuis (1994) conducted an important survey, which showed that people who favour an animal welfare friendly product also place strong emphasis on its eating quality. Regular eaters of free range pork considered that this type of pork was less fat, less dry, less bland, more tender and more pleasant than standard pork. However, when they ate free range pork, not knowing that it was free range, these features were less obvious. They only rated it as less fat. People who were not regular eaters of free range pork did not find any differences in eating quality between free range and standard pork when it was eaten without knowing its origin, but they thought that it was less fat when told that it was free range.

Environment

The market for green or environmentally-friendly products started to grow in the late 1980s. The throw-away eighties gradually merged into the eco-sensitive nineties. Green consumers became less of a marginalised minority and national differences developed

in attitudes towards the environment and behaviour in buying environmentally sound foods (Sutton and Al-Khatib 1994; Titherington *et al.* 1996). However, as the public became more educated and wiser in green matters, they became aware of the superficial nature of the environmental friendliness of some products. For example, about 10 years ago, Friends of the Earth initiated the "Green con of the year" award for the organisation that had done most to hoodwink the public.

Genuine attitudes towards the environment are deep-rooted within society, and a brief examination of some of the extremes in attitude can be helpful in understanding the fundamental outlooks. Some of the most extreme views about the environment are held by neopagans. They

- have a romantic attachment to nature, in place of a more traditional religion
- range from people who practice nature religion in organised groups, to those who place a personal spiritual slant on the Green Movement
- tend to believe that nature is in some way alive or sacred, and their values for nature are closely connected with archetypal images of ecology and the environment.

Their outlook, and those of less radical environmentalists, is being fuelled by the growing political power of environmentalism. Environmentalism is politicised in the Green Movement, and most countries have a Green Party. Its principles foster social responsibility towards the environment and global awareness. Animal Welfare is less politicised at present, although it has been embroiled in politics in the past (Gregory 1999). Modern environmentalism adopts the outlook that environmental degradation has stemmed from a society that has faith in science and technology, believes in progress and abundance, and adopts a laissez-faire economy.

It is often stated that concern about environmental quality is a luxury that largely concerns the wealthy nations. However, that claim has been challenged by the findings of the Health of the Planet (HOP) survey (Dunlap and Mertig 1995). That survey was conducted on 24 nations and it is one of the most comprehensive pieces of work in this area. It is true that people living in low Gross National Product per capita (GNP) countries rate other problems besides environmental issues as pressing. Those issues include hunger, homelessness, crime, violence, poor healthcare, high cost of living, and racial/ethnic/religious prejudice or discrimination. Environmental issues are taken more seriously by people in wealthy nations when they are compared with socio-economic issues: vis. the perceived seriousness of environmental problems relative to other problems was positively correlated with GNP ($r = 0.70$, $p<0.001$; Dunlap 1997). However, the concern for environmental quality in low GNP nations was quite broad-ranging. The HOP survey showed that poorer nations were more likely to see environmental problems as health threats ($r = -0.70$, $p<0.01$), but they believed that environmental problems had not affected their health in the past ($r = -0.29$, *n.s.*). The old assumption that non-industrialized nations do not worry about environmental protection is incorrect.

Many people claim that they are environmentally aware and that they have concerns about the environment (that are consistent with recent media attention). However, those concerns do not always translate into buying habits. Marketers have found that consumers, despite their professed beliefs, are still extremely price-sensitive when it comes to buying green. In one study, 75% of the respondents claimed that they would pay more for green grocery products. Only 14% regularly bought those goods, and only 16% avoided products from companies they considered anti-environment. Mainieri *et al.* (1997) also showed that general environmental concern was not a major determinant in green-buying behaviour. Instead, people with strong pro-environment beliefs were focused. They bought particular items that fitted their particular beliefs.

Food Safety

Although food safety has been the main consumer concern that has contributed to the growth of the organic and health food industries (Table 3), it would be simplistic to think that organic farming is the answer to all food borne pathogens. For example, organic farming does not answer the problem of knowing how to best deal with slaughterhouse waste. For the future, we need to know more about how to safely manage bulky material containing pathogenic bacteria. This includes a better understanding of how to manage the application of effluent to pasture and soil, and of what happens to pathogenic microorganisms as they percolate through the soil. In addition, we need to know how to manage a herd which is identified as carrying a potential pathogen such as *E. coli* 0157. With the advent of traceback systems from processing plants, it will be feasible in the future to identify individual properties that harbour particular pathogens and manage them accordingly.

The meat processing industry is putting greater effort into ensuring that meat is *E. coli*-free. There have been two reasons for the move towards zero tolerance for this group of bacteria. Firstly, the presence of *E. coli* in foods of animal origin indicates that there is a moderate to high risk that the food has been contaminated at some stage with faeces, non-potable water or diluted faecal matter. Whether the *E. coli* that are detected could give rise to gastro-intestinal problems in consumers, depends on the type and number of *E. coli* that are present. Secondly, certain types of *E. coli*, and in particular *E. coli* 0157, have emerged as serious pathogens in children and convalescent subjects. There has been strong consumer concern about this particular pathogen, and some companies have responded by excluding all *E. coli*, using a zero tolerance policy. One implication of this change in outlook is that there will be stronger emphasis on manure management at farms and feedlots. When bacteria or viruses are deposited on the ground in faeces, they spread onto plants, and into the soil when it rains. It is important that the bacteria and viruses do not gain direct access to surface or ground-water, and that they do not remain on the surface for long periods. Otherwise there is a risk of contaminating or infecting livestock or personnel. Most of our knowledge on the behaviour of microorganisms in this situation is based on work with viruses. We have less understanding of the behaviour and the kinetics of bacteria that are applied to the soil, but it is known that *E. coli* 0157 can survive within manure or sewage on the ground for up to 63 days, provided the faeces do not dry out. When *E. coli* 0157:H7 have been applied as a manure onto pasture in a moderately high rainfall situation, in some cases the *E. coli* persisted on the grass for over 50 days. The *E. coli* were also recovered from surrounding soil for up to 99 days (Bolton *et al.* 1999). This is an important topic where we need information to allow us to understand how best to manage environmental and human health risks.

In the short term, food safety issues will probably grow. New pathogenic bacteria have been cropping up, and there is strong evidence that confirms the emergence of antibiotic resistant strains. These are serious threats for the future and they will probably increase the cost of managing food-related risks. In a recent survey in Australia it was estimated that of the 20 billion meals eaten

each year, about 0.02%resulted in food poisoning. This seemingly small incidence represents 11,500 cases of food poisoning a day and was estimated to cost Australia $2.6 billion per year.

Genetically Modified Foods

The new consumer concern that emerged during the late 1990s is food from Genetically Modified Organisms (GMOs). There are in fact a range of concerns, and they were identified sometime ago by Macer (1992) in surveys conducted in New Zealand and Japan. Firstly, he found that about half of New Zealanders (48%) and Japanese (55%) were concerned about the prospect of eating meat from genetically modified animals. There was slightly less concern about consuming GM medicines and vegetables than GM meat. The reason for concern about eating GM products from animals are shown in Table 4. The primary issues were "uncertainty about the health effects or risks", "unnaturalness", and uncertainty about the adequacy of testing for risks. In the case of "unnaturalness" there was the feeling that GM foods are against the law of nature, that the original taste of the food will disappear, and that everything will taste the same ("shimofuri"). Under quality and purity, some people said that "artificial meat is frightening". There was also a perception that potentially harmful foreign genes might be present. Reference was made to thalidomide and cancer as examples of unforeseen disorders. In general there was close similarity in the reasons for concern amongst Japanese and New Zealanders, and there were no distinctions between GM meats and GM dairy products. There was one difference between the nationalities. The New Zealanders were concerned about knowing what they might be consuming, whereas this was not a concern for the Japanese. This could either reflect differences between the cultures in awareness about the origins of meat. Alternatively, it could be due to the greater tendency in Japanese culture to focus on benefits, rather than seeking out hidden dangers.

Comments about economic, ethical and political concerns included: "I don't trust the safety standard which is decided by the government or industry", "misuse", "can't trust the results of research looking at the effects", "can we morally accept artificial animals ?" Animal Welfare was not an important issue; only 1% of the Japanese and 5% of the New Zealanders who were worried about GM foods thought that it was relevant.

In the future, public reactions to GM foods is likely to be determined on a case by case basis. The hypothetical GM chicken is seen as a less natural product, and the public is not likely to buy it if they have a free choice (Frewer *et al.* 1996). The lack of acceptance for particular GM products seems to be closely linked to the perceived unnaturalness of the product.

Food labelling

Various shades of green are used in labelling organic-style foods. **Organic** food is produced without the use of artificial pesticides, herbicides or fertilisers. **Organic meat** comes from animals raised in non-intensive farming conditions, that are free from unnecessary medication such as antibiotics and growth stimulants, and the animals had feed or pasture that was organically grown. **Conservation grade** food is grown on soil containing certain inorganic fertilisers or chemical weedkillers, but the soil is not sprayed with pesticides. **Sustainable** means that under the production system that was used, the land could produce food indefinitely. In some countries there is a distinction between **Alternatively grown** and reform foods. Alternatively grown relates closely to organic production methods, whereas **Reform foods** have had minimal processing subsequent to growing (e.g. unrefined sugar, muesli).

Three systems for labelling welfare-friendly and environmentally-friendly products have emerged. They are Production System Identifiers (e.g. free range), Brand labels (e.g. Freedom Food) and Concept oriented labels. Richard Guy of the Real Meat Company in the UK devised a sensible system that could fit into either the Brand label or the Concept oriented labelling systems. It is called the Star Cares System. In it the product label carries boxes with stars, and an example is as follows: there are four categories; Animal Welfare, Product Purity, Environmental Issues, and Social Issues. Product Purity encompasses the use of growth promoters or additives, and Social Issues includes exploitation of under-payed labour. Each category is given a star rating on how good it is at achieving a set of required goals. No star rating would be low, and a three star rating high. If one of the categories was not assessed it would be given a cross. The advantage of this system is that it caters for most consumer concerns in a single simple format. This is an appealing way of over-coming the increasing complexity of labelling systems.

Animal Welfare	***
Product Purity	*
Social Issues	×
Environment	**

Labelling is not likely to be a panacea for all the consumers' concerns. It does not necessarily increase the feeling of control, or security amongst purchasers, which it may be designed to do. It can also have unpredictable consequences. For example, labelling GM foodstuffs could work two ways. It could either provide supermarkets with a means of excluding GM foods from their shelves. Or, it could increase familiarity and this could lead to public acceptance.

World Trade Organisation and Animal Welfare

It would be helpful if we knew whether environmental and animal welfare issues will be used in the future as Technical Barriers to Trade between nations. Until recently, the usual interpretation of the WTO agreements has been that it would be unacceptable to base a barrier to international trade on animal welfare grounds (Gregory 1995). Instead, many governments take the approach that they prefer a non-restrictive approach to meeting animal welfare objectives. Trade barriers introduced to protect the environment or animal health could be acceptable provided they are based on sound justification. However, it is possible that in the future, public concerns about food safety, the environment, the 'health' of an industry and possibly animal welfare, will have a disruptive effect on these interpretations. We have seen some signs of this in recent months. Several developed countries have taken import restraint measures without any cover of legality. At the same time these measures have not been conclusively pronounced as violating the disciplines of GATT 1994. They have been called "Grey Area Measures" (GAMs). The 1999-2002 restraint on lamb importation into the USA from Australia and New Zealand is a GAM designed at defending an industry that is unable to face competition. Curbing imports was seen as an appropriate option rather than letting market forces take their course. Another example is the continued ban on the importation of British beef into some countries in mainland Europe, on the grounds of public perceptions of BSE-related health issues. It is being debated whether the ban is a genuine Sanitary and Phytosanitary Standard or whether it is solely a measure designed to appeal to consumer concern. At the latest WTO meeting in Seattle it became clear that there was aversion amongst some nations and protestors to over-stringent application of WTO principles on free trade and investment. This in

turn might lead to more GAMs in the future. We will have to wait and see whether Animal Welfare ever becomes drawn into the justification for a GAM.

There have been cases of trade restraint that have been based on animal protection. This, however is not the same thing as Animal Welfare. In recent years there have been two Technical Barriers to Trade that have been based on animal protection. They were, restraint on tuna importation, because the methods for catching tuna also caught and endangered dolphins, and restraint on the importation of shrimps, because turtles were being caught in the shrimp nets. These two instances were considered acceptable barriers under Article XX of GATT 1994, which permits measures that are necessary to protect human, animal or plant life or health. The qualifying term "necessary" may be open to alternative views, in which case they could be GAMs.

Conclusions

1989 was one of the turning points in the history of the food industry in Europe, because of the effects it had on subsequent years. It was inundated with food scares and with concerns about food poisoning. It lead to a gradual change in ownership of responsibility for looking after the health of the public through the food they ate, and it accelerated the growth of the health food industry. In comparison with other foods, meat has often been involved in Food Scares, but it has not been a common target for scares created by consumer terrorism. Now, the main drivers towards natural or organic foods relate to personal health, pesticides and environmental contamination.

In some countries there is a strong cultural involvement with the environment. There is a powerful respect for nature that is intertwined with a drive to protect it from human destruction. A growing outlook is that nature is best protected by minimising human involvement, as it is self-sustaining and would be almost eternal if human interference was absent. The alternative outlook is that the planet is becoming overstocked with people, and it is becoming difficult for society not to encroach on protected land. For every 2 hectares of snow/ice-free land on this planet there is one person, and if the population plateaus, as is predicted, at about 10 billion people this will rise to one person for every 1½ hectares. In reality, undisturbed ecosystems are a dwindling resource and nature management is now an integral part of protecting those reserves (Budiansky 1995). Environmental and waste management must become a stronger focus if we are to avoid Food Scares and increasing problems with pathogens in the future.

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