

INTRODUCTION

(N) Doubt some meat scientists and technologists are content to study meat as an interesting biological material, forced from the industry that depends on it and the consumers that enjoy it. But most of us are concerned with that industry. We have an interest in its practices, problems, scale and profitability, and in its consumers and their attitudes to the industry and its products. That is why this International Congress begins with a consideration of the current state of consumer demand, at a time when our industry is under particularly intense criticism. Is there substance in that criticism and, if so, should it affect our research objectives?

Not from those who for ethnic, racial or religious reasons do not eat any meat (mainly in Asia), most of the world's 5½ billion population are our consumers. What is more, the great majority want to eat meat (from selected species), have few concerns about its production or consumption, and have a strong positive attitude towards this food. But the amount they actually consume is influenced by a whole range of market factors including income, availability, price, visual appeal, fitness for purpose, the choice of alternative foods available and (not least) the eating satisfaction experienced.

in contrast to these positive consumers, there is a growing minority in certain developed countries, who I will describe as the "concerned consumers", whose purchase and consumption patterns are influenced, not only by market and taste factors, but by growing concerns about the healthiness of meat and about modern methods of production and their impact.

(D) This paper is mainly about these concerns and the commentators and consumers who have them - but the changing market factors affecting consumption among those with positive, unconcerned, attitudes (as well as among the concerned minority) will first be considered.

(F) Consumers with strong positive attitudes to meat - the great majority of the world's population - display a very wide spectrum of consumption levels. Developing countries account for three quarters of the world's population but provide only 40% of the world's meat production. During the 1980s, meat production in developing countries grew by nearly 50% to some 17 Kg per head, compared with a population growth of 20%, but there remain wide variations of consumption levels between and within developing countries.

At one extreme, large numbers in undeveloped countries eat little meat because they are poor and it is a relatively expensive food. Indeed many are seriously undernourished, subsisting on monotonous cereal or rice based diets, at the mercy of climatic fluctuations and the disruption of supplies by local conflicts or changes in world prices. A relatively small amount of meat incorporated in the diets of these populations is of considerable nutritional benefit; in particular the high bioavailability of iron and zinc from meat is very

important in view of the fact that iron deficiency is the world's most common disease and zinc deficiency a public health problem in under-developed countries.

In many less developed countries, there are emerging middle class urban populations that are relatively compared with their rural compatriots. Such groups look upon increased meat consumption as one of the which their increased affluence is reflected in an improving life-style; their demand leads to the setting up of intensive units based on imported inputs or to meat imports in exchange for locally grown cash crops. meat consumption in developing countries is strongly related to economic growth, although the relative culinary traditions remain important in determining in individual countries the pattern between. Overall, developing countries are expected to account for a higher proportion of world meat consumption remainder of the 1990s (whether from indigenous production or imported), but per capita consumption is expected to grow much because of population increase.

Market pressures operating in developed countries with relatively high levels of consumption (83 Kg per year on average) derive from changing lifestyles and retailing practices. The simple foods regularly consumed in the past are to a degree supplanted by a wider choice of prepared or processed foods which may contain less than the traditional purchase or even no meat at all. Many developed countries are experiencing changes in lifestyle as social structures change, as affluence increases, as families fragment and as individuals achieve more leisure time. This leads to major changes in meal patterns and the time available for preparation and consumption, so increasing the demand for such convenience foods. The red meat industry has been slow to its poultry competitors in developing and marketing new added-value products.

In such countries, meat is not the focus of the meal to the extent it was. These factors have led to a decline in domestic purchase of beef and pork in those developed countries that lead such changes - although this has been partially counterbalanced by increased purchase of take-away meals and increased eating out of the house.

Despite relative affluence in developed countries, price remains a key factor for a high proportion of the public, so manufacturers and retailers continue to compete on price as well as on quality and variety. The wide choice available means that consumer expectations rise and, in particular, their willingness to purchase depends on a high degree of eating satisfaction and demonstrable consistency. This represents a considerable challenge to meat scientists faced with a biologically variable supply and a processing industry which frequently finds quality control difficult and expensive.

THE CONCERNED CONSUMER

Throughout the developed world, some consumers have become concerned about some aspects of meat consumption production to an extent that demand has been or is in danger of being affected adversely. These concerns relate to the effects of meat consumption on human health, the effects of traditional practices of meat production, transport and slaughtering methods on animal welfare, the belief that livestock production is wasteful of foods suitable for direct human consumption and the effect of livestock production on the environment.

issues are not, of course, independent. Nor are they equally important in all the communities where they raised. While there is no comprehensive international market research which allows objective assessment of relative importance and impact in different countries, a review of the national market research available (relating to 18 countries) provides some clues.

The most difficult aspect of assessing these "concerns" is to determine their effect on purchasers of meat. The concerns develop among analysts and commentators, and generate interest groups who, in turn, generate publicity to one degree or another. But how much of this actually rubs off onto the ordinary meat buyer affects their purchasing behaviour is difficult to determine since so many other market factors are also operating. Market research is difficult because of differences between what people "say" and "do".

Short-term impact may be quite small, because the eating habits of middle aged consumers are relatively stable; they are predominantly concerned with price and have long-held aspirations to eat a 'better' higher meat only marginally modified by modern dietary advice. However, the impact on the eating habits of the emerging generation is potentially very great. Teenagers and young adults are more sensitive to criticisms of meat as a result of the impact of production systems on animals and the environment; this poses two major challenges for the meat industry - to inform and explain to this age group, but also to modify and control practices so that the younger generation (judging by different criteria) see meat as positively as their predecessors.

So, if these are those concerns, how does the younger generation view them and what changes are necessary in the industry to meet them?

ETHICAL CONCERNS

In countries where the majority of people eat meat, there are those who believe it is wrong to exploit animals (fish and poultry as well as mammals) for human food and, in particular, to slaughter them and eat their flesh. There is a long tradition of vegetarianism in Western culture and it is inevitable that the accumulation of the specific concerns listed below should have led to some increase in claimed vegetarianism in recent years, and this has been stimulated by the publicity accorded to animal rights philosophers and their more extreme supporters.

Teenagers are particularly susceptible to these arguments. In a recent survey of British young (with urban and rural groups equally represented), 35% of girls felt it was wrong to kill animals for food, and 60% felt farmers should keep sheep for their wool but not for their meat! But the actual percentage of those who in practice reject all "fish, flesh and fowl" is much less than these figures, even among teenagers; among British women, vegetarianism is running at 2-3% - a surprisingly low figure given the widespread publicity to the issue in all media and in books.

Vegetarianism as such is not a major issue for the meat industries of the developed world - the real issue is the weakening of demand among meat eaters because of a combination of market factors and specific "concerns".

HEALTH CONCERNS

The two concerns that are most widespread in the developed world relate to residues and contaminants, over-nutrition. Concern with residues and safety tend to fluctuate in response to specific incidents, although underlying uneasiness remains even when the publicity surrounding these dies down. In contrast, concern over calorie control and diet composition, particularly in relation to the fat in meat, is continuous; it is prominent in some countries, whereas in others vigorous industry promotional activity appears to have improved consumer attitudes in this respect.

Residues

The fear that substances administered to animals to promote growth or to prevent or treat disease will leave residues in the meat which are harmful to the health of the consumer is common in the developed world. Similar considerations apply to other "chemicals" used in producing the plants that are used to feed animals, and "additives" in some processed meat products.

The concern with growth promoters was triggered by the misuse of stilbenes in the 1960s. These were subsequently shown to be carcinogenic. Publicity about these "hormones" carried over in an uncritical way to other steroids in cattle, leading in 1988 to a ban on their use in the European Community despite considerable evidence that if properly used these offered no prospects of harm to beef consumers. Despite pressure from consumer organisations, many countries have not followed the EC example (perhaps because of the strength of production lobbies) and this difference of approach has led to tensions in international trade.

Growth stimulants, and products designed to improve the lean to fat ratio, now face great resistance from consumer organisations during the process of approval by the regulatory authorities. This has led to a moratorium on BST approval for dairy cattle use in the EC and parallel delays in the USA. This also affects the chances for approval of bovine growth stimulants and PST although the latter is likely to be approved in the USA shortly. That country's politicians are insistent that regulations should be science-based.

However, the major companies investing in the development of such products will have to consider whether the costs of development and attempted approval are justified in such an uncertain atmosphere. Scientists may reconsider the priority they give to research on exogenous stimulants; but, another view is that because of the world's developing food and environmental problems, it could be morally unacceptable not to use growth stimulants if safe.

Consumer representatives argue that, while the risks for consumers may indeed be negligible if the products are properly used (method of administration, dose and withdrawal procedures), how can this be controlled? Consumer confidence in the approval, regulatory and control process is vital to continued meat demand in the future in the developed countries; the official procedures will need to be supplemented by convincing self-regulation in the form of assurance schemes. Even if that were achieved, there will still be a significant population who will seek out meat produced without benefit of these aids which is therefore more expensive per

Unfortunately, there will still be those in the industry who break the rules, generate adverse publicity and damage the image of our products.

...the animal diseases that also affect humans, are another obvious concern to those who probe into production practices. How effective are the control and inspection procedures? Food poisoning incidence is increasing in many countries, and meat and meat products (particularly poultry) are frequently implicated. Is this due to poor control of new methods (cook-chill preparation, for example), to mishandling by caterers or to alterations to production methods? Most developed countries have had their "food scares" whereby demand for a food (including meats on some occasions) has collapsed for a period following a particular outbreak or related event. Clearly the challenge is to reduce contamination, develop effective controls and to educate consumers.

nutrition and fat

The message of health professionals that the typical western diet is a major risk factor for the "diseases of affluence" (coronary heart disease and certain cancers) is now widely disseminated through the developed world and, indeed, among the middle classes in other countries. The "western" diet is considered too high in fat (particularly in saturated fat) sugar and salt and too low in fruit, vegetables and complex carbohydrates. Where the traditional diet is "healthier" - Japan and some Mediterranean communities for example - the population is discouraged from adopting western eating habits. This same message is now being promoted to developing countries such as China.

As a result, the concern for healthy eating is widespread. Although those who respond by altering their diet significantly in the medium term is probably no more than 20-25%, even where this advice has been widely promulgated for 10-20 years, the long-term effect must be to change attitudes.

Red meat suffers from these concerns because it is widely regarded and widely publicised as a fatty food. This is not true of modern lean red meat, trimmed of visible fat, which is less fat than much poultry; but it is true of certain traditional and popular meat products. Nevertheless, regular consumption of lean meats and moderate consumption of meat products are quite consistent with diets deriving a total of no more than 30% of calories from fats, and no more than 10% of calories from saturated fats - while the "healthy foods" - breads, potatoes, cereals, pasta, pulses, fruit and vegetables - are all natural accompaniments to meats in a balanced diet across cultures.

Progress has been made in countries where this dietary message has penetrated strongly into the attitudes of consumers in persuading them of the true nutritional status of red meat and the low-fat nature of lean meat. Previously red meat was classified as a "bad food" by medical authorities, there are an increasing number of leaflets and programmes from governmental or professional sources that classify lean red meats, with poultry and fish, as desirable components of the diet - although the media do not always acknowledge this. In Britain, the perceived healthiness of red meats has declined since the mid 1980s even though consumption has been static.

Moreover, mis-information about dietary cholesterol continues to confuse consumers in some countries and it has become fashionable among nutritionists to talk down what are seen as unnecessarily high levels of consumption in the developed world, as the undoubted nutritional benefits (in terms of high quality protein, vitamins and minerals of high bio-availability) can be achieved at quite low levels.

Heating most, if not all, muscle foods by a variety of cooking methods can produce mutagens and this is a matter of public health concern. However the other elements of a balanced diet can have a protective effect and cooking methods can be modified to reduce the risks to levels below that arising from other aspects of modern diets. These concerns have not impinged widely on consumer attitudes to meat in any part of the world.

This is not the place to analyse the status of the "lipid hypothesis" but it is clear that advisers are tempering their message to put less emphasis on what not to eat, and more on what one should eat. Also there is a recognition that the important saturated fats in meat are not "top of the league" for cholesterol-raising and that the beneficial long-chain-fatty acids found in fatty fish are also significantly present in lean meats.

The meat industry and its scientific advisers - world-wide - must continue to provide the lean alternative, label informatively, and to promote the positive nutritional virtues of meat, the ways in which fat consumption can be controlled and the sensory pleasures of meat as a food (which may be in conflict with decreasing fat intake).

ANIMAL CONCERNS

Across the world, the full spectrum of attitudes towards animals can be found from those who believe that the exploitation by man is unacceptable (certainly including their slaughter to provide food) to those who regard animals as "things" of no account and who adopt practices of mutilation, immobilisation, close confinement, sensory deprivation, or force feeding as a matter of course in the context of food production. The emotions aroused in those who have concern for animals to one degree or another are incomprehensible to those of other cultures.

Concern for animals is growing in Britain and some other Northern European countries to the extent that it is affecting legislation, industry practice and self-regulation, leading to the marketing of "humanely produced" meats derived from modified production systems which usually also incorporate reduced use of "chemicals". In these countries, the market for such meats is variously estimated at 5-30% of the total. Those who market them have been disappointed that expressed attitudes of consumers have not always translated into purchasing behaviour - particularly at times of economic recession.

Just before the British General Election this year, a survey sought to find out "the extent to which political parties should be forced to face the issue of animal welfare". Over 60% said they "strongly agreed" or "agreed" to agree". But some commentators dismiss the relevance of expressed concerns about the welfare of animals. They point to the publicity about cruel and intensive poultry production methods and contrast it with the high level of poultry consumption. However this could be misleading; illogical though it may be, poultry (and indeed other animals) clearly do not raise the same emotions as horses, calves, lambs or even pigs.

Particular welfare concern relates to intensive production systems, particularly of poultry, but also of pig calf production and some beef finishing systems. The critics refer to these as "industrialised" or "factory" farming; concern (much stimulated by television films) relates not only to close confinement, nutritional deprivation, mutilation, slatted floors and the inability of animals to express normal behaviour traits (rooting, example) but to the potential disease threats and the necessary prophylactic use of drugs to contain this. Animal scientists themselves have begun to question the unremitting pursuit of productive efficiency, noting the biological imbalances caused and the breakdowns that occur.

Many consumers hanker for more "natural" production systems (meaning freedom to forage, access to fresh air but also warm dry shelter, low densities, avoidance of growth stimulants, avoidance of "unnatural" feeds and strict limitations on medication), although it is not always clear that the true welfare of the animal is improved by these changes. Most advanced developed countries now have a small market for organic (or biological) produce, derived from systems that completely avoid "chemical" inputs and incorporate considerate attitudes to animal housing and handling. But the high premium required to meet the added costs of systems that abandon most twentieth-century cost-reducing technology will inevitably limit the growth of the organic meat market - at least until the true costs of conventional production in terms of energy, resources and pollution become reflected in the pricing system. Pressure to identify method of production at point of sale will increase.

Producers in countries where consumer concerns have led to tighter regulations on welfare issues (or on the use of antibiotics) are worried that meat produced in competitor countries without such concern and therefore lower prices will undermine their market. Conversely, Governments and industry bodies may seek to introduce constraints on their producers, even where there is no domestic concern, in order to protect export markets. Only time will tell which fear will dominate.

In countries outside Europe, while minority groups may be vocal and welfare is perceived as a growing issue, it has not yet had a significant impact on industry practices. It is of interest that key papers on demand strategy and market segmentation from the USA, Australia and New Zealand refer only to market factors and health concerns in those markets - there are no references to concern about methods of production. Nevertheless, New Zealand promotes its lamb in Britain as "..... naturally reared, just as meat should be". And the American National Cattlemen's Association has found it desirable to publish a leaflet entitled "Cattlemen Care - a commitment and a way of life", while American food scientists have established Response Teams to provide rapid reaction when questions or challenges arise about animal agriculture.

"THIRD WORLD" CONCERNS

There is no doubt that in terms of a simple comparison of productive efficiency, one hectare of good quality land can feed more humans if their diet is confined to plant foods, than if some of these plant foods are processed through animals to produce meat. However this simple equation, frequently used to criticise the levels of meat consumption in the developed world which exist side-by-side with the spectacle of starvation in parts of the third world, no way reflects the full complexity of the situation.

Most grazing livestock are not produced on high quality land, but on hill, marginal, range or wetter areas suited to grass production and which could not be brought into production of foods suitable for direct human consumption without considerable use of and expenditure on energy and "chemical" inputs. They serve the vital role of converting feeds unsuitable for humans into nutritious foods. Grazing livestock in mixed farming systems contribute to the total productivity of the unit through the benefits of rotation and the application of their wastes to improve soil fertility. Feed grains contribute only about 15% of the requirements of cattle worldwide (although a higher proportion in some developed countries) and much less of those of sheep.

Their use is primarily for pig and poultry production where conversion ratios of feed to meat are relatively better. If feed grains were not fed to these species (or if demand for these meats fell), would the problems of starvation and hunger in parts of the world disappear? Unfortunately the solutions are not so simple. The effect would be less production of feed grains, since there is already a world surplus and policies both in the USA and the EC to reduce production by "set-aside" programmes. In Britain and the European Community, for example, a surplus of cereal production that is there even after the needs of our livestock population has been met is exported.

International organisations concerned with the problems of feeding a growing world population know that the major problems are of poverty, local conflicts and debt. Whereas surpluses can be exploited for short-term aid, in the longer-term the developing world must become stable and self-supporting - and that means the level of demand for meat in the developed world, provided it is achieved by locally sustainable systems, will be irrelevant. The political, cultural and social problems are immense, but reducing demand for meat in the developed world will not hasten or influence the solutions.

Nevertheless, these concerns are extensively promulgated in developed countries, particularly in school and interest groups, and the publicity and the arguments, however erroneous, may prove damaging to demand.

ENVIRONMENTAL CONCERNS

Lack of awareness of the environmental damage being done has been a fault of industrial development throughout the world over the last century or more - and agriculture and livestock production are no exceptions. The meat industry has come under attack for its environmental impact world-wide, with reduced demand or even the abandonment of meat eating put forward as the solution. Trying to tackle these problems from the demand side is, of course, not very efficient even if the basic premise that meat production is at fault is correct. The response is likely to be slow and too small to have real impact. Switching demand from one product to another involves moving from one set of problems to another which may or may not be more tractable.

The more valuable approach is to carry out an objective analysis of the environmental impact of livestock production world-wide, to recognise the errors of the past are due to mismanagement and to try to correct them. Correction may or may not lead to a reduction in total livestock numbers and/or in meat production. In some areas, numbers have to be reduced in certain areas where too many livestock destroy natural habitats, lead to

erosion or water pollution or to a build-up of waste products in excess of what the land can absorb and utilise efficiently. But equally we may see expansion in other areas where intensive crop production is being replaced by mixed farming including relatively extensive low-input livestock systems.

A challenge facing agriculture is to feed a rapidly growing population using less non-renewable resources and causing minimal environmental damage and pollution. A sensible balance of livestock and crop production will be achieved over large parts of the world, developed and underdeveloped. Integrated systems using minimal external inputs will achieve localised self-sufficiently and genuinely sustainable systems.

In these circumstances much of the technology developed over the last 45 years (largely appropriate to intensive production) will have little place - but new technologies appropriate to low input alternative systems will have to be developed. It is clear that the greatest potential is to use the new genetics to breed animals which are, for example, adapted to such conditions, resistant to disease, capable of exploiting arable and other plant products and producing waste of modified composition while yielding either the quality products demanded or the quantities required; the relative importance of quality and quantity will be determined by the affluence of the relevant communities.

GENETIC ENGINEERING CONCERNS

Consumer concern may yet be frustrated by the emerging concerns among the affluent minority about genetic engineering. These concerns derive from a distaste for animal manipulation, a fear of "monsters" or welfare problems with the engineered animals, or worries about the unpredictable side effects of the changes achieved when the animals are released into the environment.

The EC's Eurobarometer in 1991 showed that there was greater concern about the use of genetic engineering or biotechnology to improve performance of farm animals compared with a range of other possible uses, although this concern was clearly greater in Northern than in Southern European countries. Also the balance of concern between human health risk and animal welfare was markedly different from country to country.

Genetic engineers, who will undoubtedly be closely regulated, have to recognise the need to carry concerned consumers with them and, if necessary, restrain their experimental enthusiasm until the climate is right. For example, was it sensible to insert copies of human genes into pigs when so few consumers understand the nature of the genes? Predictably it led to worries that eating such pork was close to cannibalism!

It would be sensible to confine genetic engineering to manipulation within the species until the consuming public has had enough better scientific education is ready for inter-species transfers. Even with this constraint, there is ample opportunity for more rapid improvements over a wider range of traits than those that can reasonably be achieved by conventional cross breeding and selection.

CONCLUSION

Demand is driven by conventional market forces over much of the world among consumers with strong positive attitudes to meat as a nutritious, tasty and premium food; price in relation to income, availability, (including leanness) and relevance to life-style remain the dominant forces operating.

But in the developed world, there are emerging concerns about how meat is produced which are likely to have negative effects on demand, particularly that of the current younger generation, and which may well be expected to affect Government policies towards the meat industry.

The industry needs to establish strong information and educational programmes, but also to examine its production to provide greater consumer assurance about practices and controls. Also the scientists and technologists serving the industry need to help it move towards sustainable lower input less environmentally damaging systems with less reliance on drugs, stimulants and additives, sensitive exploitation of the new genetics and due consideration for the animals involved.

TO148-3.8/28.5.92