

An agricultural approach to the new health policy

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Two recent medical reports on health policy have associated coronary heart disease in man with the excessive consumption of fat, particularly saturated fat (National Advisory Committee on Nutrition Education (NACNE), 1983; Committee on Medical Aspects of Food Policy (COMA), 1984). Public concern is warranted for, according to the COMA Report, the death rate due to coronary heart disease accounts for 31% of deaths in men and 23% in women, and the combined rate is higher in Scotland than anywhere else in the world (see Fig. 1).

The NACNE and COMA Reports make recommendations largely similar to those made some time ago in the United States and Australia where the incidence of coronary heart disease has been falling: the fall in the UK and in Scotland has been relatively small. The recommendations are that the total fat consumption and fat intake as a proportion of the energy intake should be reduced. Recommendations are also made about the consumption of fibre and salt, but it is the recommendations concerning fat that have the greatest and most significant effect on agriculture, and prominence will be given here to the impact of the recommendations about fat intake on agricultural policy.

The recommendations in the two British reports, NACNE and COMA, differ in both the timing and the amount of fat reduction called for. The NACNE Report recognized that time would be necessary for changes in public attitudes and in

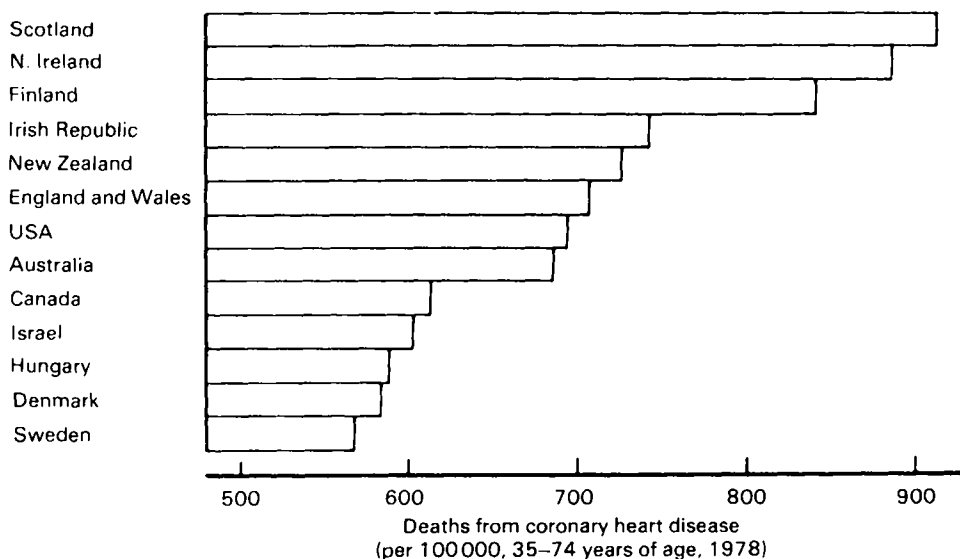


Fig. 1. The relation between death rate and coronary heart disease (from Committee on Medical Aspects of Food Policy, 1984).

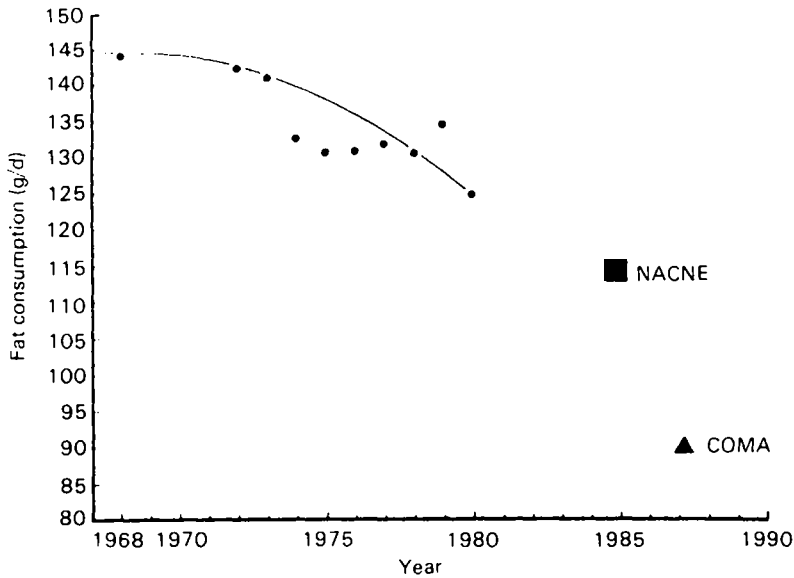


Fig. 2. Fat consumption in the UK in relation to recommended intakes: (■), from National Advisory Committee on Nutrition Education (1983); (▲), from Committee on Medical Aspects of Food Policy (1984).

agricultural and food manufacturing practices and so long-term and short-term objectives were defined, the short-term ones being those that might be accomplished in the 1980s.

From the medical point of view it is both the absolute amount of fat and the proportion in the diet that are important, but the immediate impact on agriculture is defined more by the change in the amount of fat eaten. Simple calculations based on current UK population figures reveal that the short-term NACNE recommendation means the removal of 267×10^3 tonnes fat/year from the human food-chain, while the corresponding amounts to meet the long-term NACNE and COMA recommendations are 524×10^3 and 452×10^3 tonnes respectively.

Fat consumption in the UK has declined significantly over the last 10 years, probably as a direct result of the increased demand for lean meat by the housewife; over the same period fat as a percentage of intake has, if anything, increased, from 39% in 1972 to just over 40% in 1982. The increased lean meat production has largely been accomplished by changes in breeding policy, particularly in pigs where, for example, it has been estimated that pig carcass leanness has improved by 0.1 kg lean/year, said to be worth £1.5–2 million/year (Meat and Livestock Commission, 1981). The estimated fall in fat consumption (g/d) is given in Fig. 2 together with some idea of the further reductions that would have to be made to meet the NACNE and COMA recommendations.

The questions we must now ask are whether further reductions to meet the recommendations can be made and to which section of the agricultural industry would it be reasonable to target these reductions.

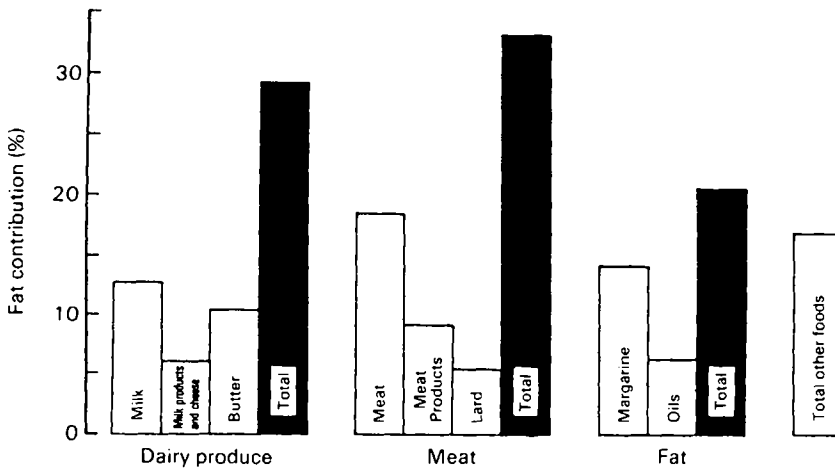


Fig. 3. Contributions to fat intake (%) in the UK from different dietary sources (calculated from information published by the Central Statistical Office (1984)).

The contribution of various foods to our total fat intake is given in Fig. 3. The contributions are calculated from information published by the Central Statistical Office (1984) and are based on the National Food Survey.

In practice, these contributions are not so clearly defined because biscuits and some other foods, for example, derive some of their fat from the meat and dairy industries. Nevertheless, it would appear that the meat and dairy sections of the agricultural industry will have to bear the brunt of the new recommendations.

Impact on meat production

There are considerable variations in the fat content of carcasses from different species and variations within each (see Table 1). Pigs are, on average as currently marketed, markedly fatter than cattle or sheep, but there is a greater range of fatness in sheep.

The total fat produced from these animals in the UK is given in Table 2. Thus, on average, the total fat produced by the UK livestock industry is about 945×10^3 tonnes/year and this amount should be compared with the total reductions of 267×10^3 and 453×10^3 tonnes/year called for by NACNE and COMA respectively.

Table 1. *Total fat in the carcasses of different species (%) (after Kempster et al. 1982)*

Carcass type . . .	Fat content (%)		
	Lean	Average	Fat
Beef	16	25	37
Pig	22	31	38
Sheep	14	24	38

The short-term NACNE and COMA proposals mean removing 28 and 48% respectively of the total fat produced. It is worth noting that quite a lot of meat is still imported into the UK, and this accentuates the burden on the UK meat industry if the fat reductions are to come only from home produce.

The question is: 'How much fat can be removed by changing our production methods?'. It would be impossible to meet all the recommendations by changes in animal production alone because there are considerable differences between species in the proportion of subcutaneous fat, i.e. that fat which might be removed by processing (see Table 3). Removal of subcutaneous fat would amount to some 469×10^3 tonnes/year, approximately equal to the COMA recommendations but, obviously, only a proportion of the subcutaneous fat could be removed. Processing by mechanical means might well be a reasonably cheap way of defatting carcasses, but further defatting by the removal of intra-muscular fat would be labour intensive and involve high costs for a relatively small reduction in fatness.

The next factor to be considered is how fat could be reduced in the human food chain by altering slaughter weight and growth rate, etc. A former colleague, Dr Michael Kay, dissected several hundred carcasses of different breeds at the Rowett Research Institute. The calves were reared to 300 kg live weight at different rates and then allowed access to concentrate (mainly barley) and roughage (dried grass) *ad lib.*; his findings have been used to illustrate how body composition changes as slaughter weight increases. The changes in Hereford \times Friesian cattle are illustrated in Fig. 4 and, even at 275 kg slaughter weight, 75% of the incremental weight gain was dissectible fat.

Clearly then, if slaughter weight is reduced, carcass fatness can be reduced. Kempster & Harrington (1979) estimated that in 1976, 48×10^3 tonnes fat were produced by fattening cattle beyond the most efficient point which they estimated to be the then Meat and Livestock Fat Class II. The equivalent weight for sheep was 12×10^3 tonnes. They estimated that 207×10^3 tonnes were produced by cattle in excess of customers' requirements. As nutritionists, however, we have to ask the question whether efficiency will be impaired if slaughter weight is reduced.

Table 2. *Total fat production from different species in the UK (tonne $\times 10^3$ /year)*

Carcass type	Beef	Pigs	Sheep
Lean	297	232	47
Average	464	401	80
Fat	687	327	127

Table 3. *Fat distribution in different species (after Kempster et al. 1982)*

	Percentage fat in average carcass		
	Beef	Pigs	Sheep
Subcutaneous	8	22	11
Intermuscular	13	6	10

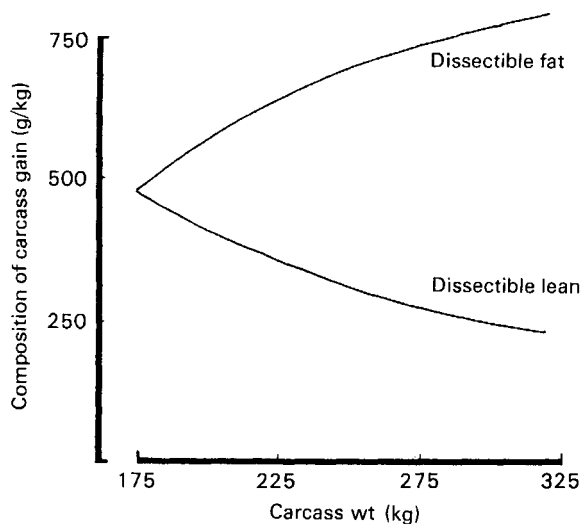


Fig. 4. Composition of carcass weight gain in Hereford \times Friesian cattle.

Table 4. *Incremental change in feed utilization of grass-fed Hereford \times Friesian cattle*

Live-wt range (kg) . . .	350-400	400-450	450-500	500-550
Feed utilization (kg DM/kg gain)	8.8	12.1	15.4	20.8

DM, dry matter.

Reduction in slaughter weight should improve efficiency of feed utilization of the steer itself because it has been estimated that it takes nearly four times as much food to produce fat as it does to produce lean (Wood, 1980). The effect on food utilization calculated from Kay's findings is given in Table 4. The actual rate of growth of the cattle did not change markedly between each live-weight period, but as slaughter weight was reduced the total lean content of the carcass was also reduced (Fig. 5). Since less total lean meat is produced in the carcass, it is important when calculating the efficiency of lean-meat production that account is taken not only of the food eaten by the steer but also of that consumed by the dam. In calculating the efficiencies of lean-meat production from steers, the maintenance energy of the dam (52 MJ/d) has been used together with those for pregnancy published by the Agricultural Research Council (1980). The total feed energy consumed was the summation of these plus the energy cost of rearing the calf, and the energy actually consumed by the steer to the various weights shown in Table 5; the efficiencies are given as kg dissectible lean/GJ energy consumed.

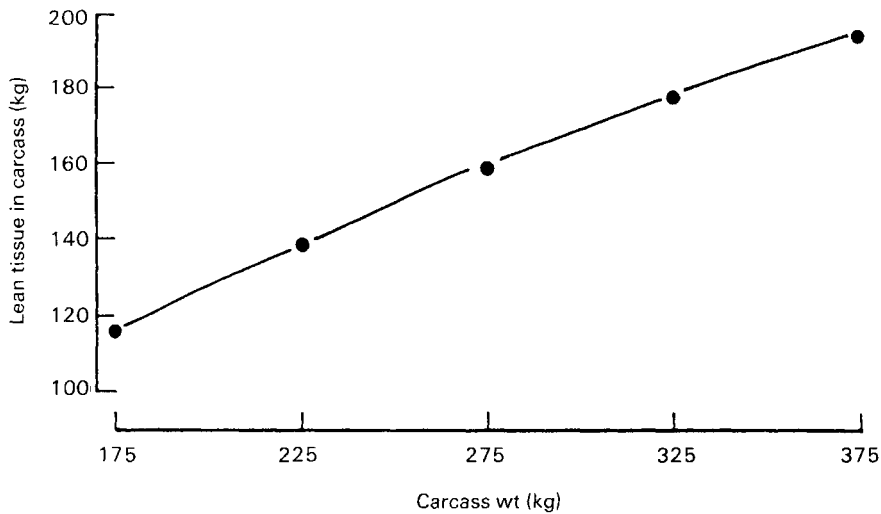


Fig. 5. Lean content at different carcass weights in cattle.

The efficiencies for Hereford \times Friesian steers given different types of diet are given in Table 5. For steers given roughage- or concentrate-type diets, efficiency became markedly worse when slaughter weight was reduced to 400 and 450 kg live weight respectively. Below these live weights, efficiency tended to plateau and there was no evidence, at least down to 350 kg live weight, that efficiency was impaired due to the increased proportion of the total energy that the dam consumed. Steers given concentrates were more efficient than those given roughages because they grew faster and therefore a smaller proportion of the energy intake was used for maintenance.

The same calculations were undertaken for two breeds, Hereford \times Friesian and Friesian, given a roughage-type diet, and the efficiencies are shown in Table 6. For Friesians, efficiency was improved as slaughter weight was reduced even down to the lowest slaughter weight of 350 kg, presumably because they contained more lean meat than Hereford \times Friesian when compared at the same live weights. Hereford \times Friesian were less efficient than Friesians because they mature earlier and deposit fat at a much earlier age. It would therefore seem feasible to reduce slaughter weight in these breeds to at least 450 kg live weight without impairing the energy efficiency of lean-meat production. Based on cattle numbers and the average weights at slaughter, it can be calculated that fat production from cattle

Table 5. *Efficiency of lean-meat production in Hereford \times Friesian cattle (kg dissectible lean/G \ddot{J} energy consumed)*

Feed type	Live wt at slaughter (kg)					
	350	400	450	500	550	600
Roughage	3.27	3.26	2.96	2.78	2.63	2.44
Concentrate	3.56	3.56	3.58	3.41	3.38	3.01

Table 6. *Efficiency of lean meat production in Hereford × Friesian and Friesian cattle given a roughage diet (kg lean/Gf)*

Breed	Live wt at slaughter (kg)					
	350	400	450	500	550	600
Hereford × Friesian	3.27	3.26	2.96	2.78	2.63	2.44
Friesian	3.46	3.31	3.12	3.01	2.84	2.62

could be reduced by some 240×10^3 tonnes/year by the reduction of slaughter weight alone.

One interesting aspect of these results is the higher efficiency of lean-meat production for those cattle given concentrates. The growth rate of these cattle was higher than those given roughages and their efficiency of lean-meat production higher. This is in line with observations made recently by Fowler (1985) that the efficiency of lean-tissue growth and economic return to the farmer were actually higher in pigs given feed *ad lib.* compared with those given restricted amounts.

Fowler (1985) studied values from the Meat and Livestock's Product Evaluation tests, in which pigs given feed *ad lib.* produced more lean tissue per d which was, however, associated with more fat per carcass. He advocated the removal of fat by butchering, and suggested that the excess fat could be used as a component of pig feed or as a feed stock for industrial processes which involve fat, thereby removing the fat from the human food chain.

Bull beef, which is the traditional form of beef production on the continent, is only a small but growing part of a production in the UK. It is well established that bulls are leaner and utilize their food more efficiently than steers by some 5–7.5% in each case and the development of a market for bull beef would significantly reduce the fat entering the human food chain. If only 50% of the market were supplied by bull beef this would account for 10% of the short-term reductions called for by NACNE.

Implications on the dairy industry

There are fewer opportunities to remove fat produced by the dairy industry from the human food chain.

The application of quotas has gone a long way towards reducing the total fat produced from milk. If the proposed quotas are met, then 53×10^3 tonnes less fat per year will be produced. Over the past 10 years butter consumption has been declining while the use of margarine has steadily increased; the trends are shown in Fig. 6 which has been plotted from data presented in the *Annual Abstract of Statistics* (Central Statistical Office, 1984). In fact, less fat is now being produced by the dairy industry than previously. Liquid-milk consumption has also been dropping with more milk being used for the manufacture of skimmed-milk powder (Fig. 7), but the general trend has been for the skimmed milk to be diverted for use in the animal feed industry. The use of skimmed-milk powder in the human diet

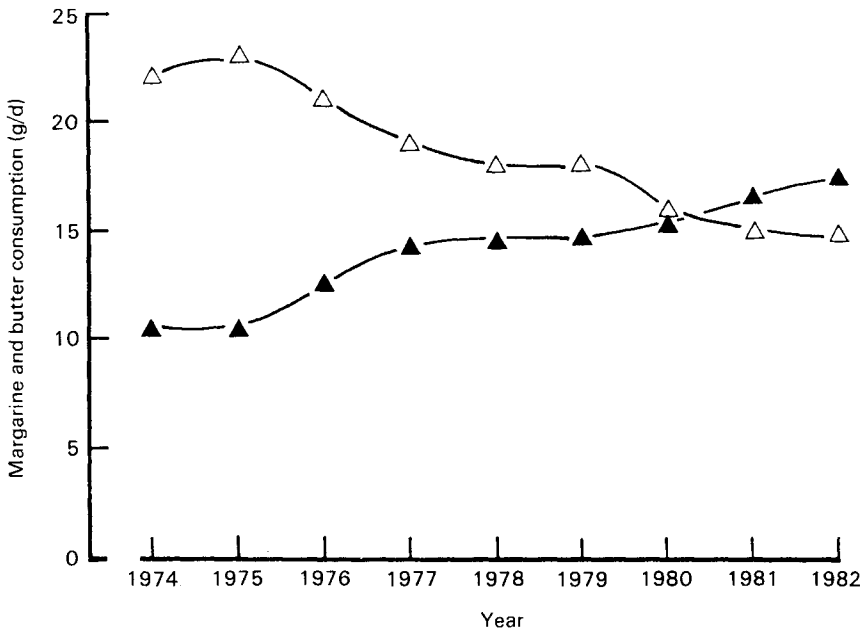


Fig. 6. Trends in (▲) margarine and (△) butter consumption in the UK.

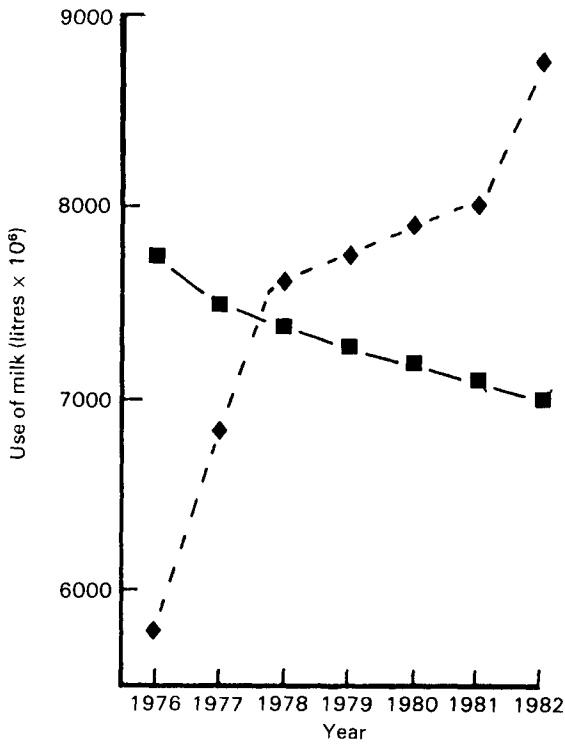


Fig. 7. Changes in the use of milk: (■), liquid milk; (◆), manufacture of skimmed-milk powder.

has actually fallen. In 1976 production of skimmed milk was 170 ktonnes/year and rose to 296 ktonnes/year in 1982; over the same period milk-powder consumption fell from 2.2 to 1.3 kg/head per year. The present policy is for some of the skimmed milk to be denatured so that it cannot be used for human consumption while the butterfat is taken into intervention and there are price incentives from time to time to increase its consumption; thus the policy removes the high-protein, low-fat milk powder from the human food chain and provides incentives to increase consumption of butterfat.

If further fat reductions are to be made then it must be through processing coupled with an attempt to increase the sales of skimmed and semi-skimmed milk. This policy would only be successful if the fat removed did not enter the human food chain. How far such a policy would go to meeting NACNE recommendations is given in Fig. 8.

A reduction of 1.5% units in butterfat in milk, which is a drastic reduction, would only remove 39% of the amount recommended in the short-term NACNE proposals. It is interesting to note that according to the latest values from *United Kingdom Dairy Facts and Figures* (Milk Marketing Board, 1984), butterfat percentage has hardly changed since 1955. It was then 3.83%, the same in 1967, 3.81% in 1971 and 3.77% today and this is against a background of a price incentive for fat; one suspects therefore that progress by genetic selection of dairy stock for yield and against fat might well take decades to reduce butterfat percentage by even small amounts. Something could, of course, be done to change butterfat percentage by altering the nutrition of the cow, but here again the potential is small and must be viewed against the background of the application of quotas.

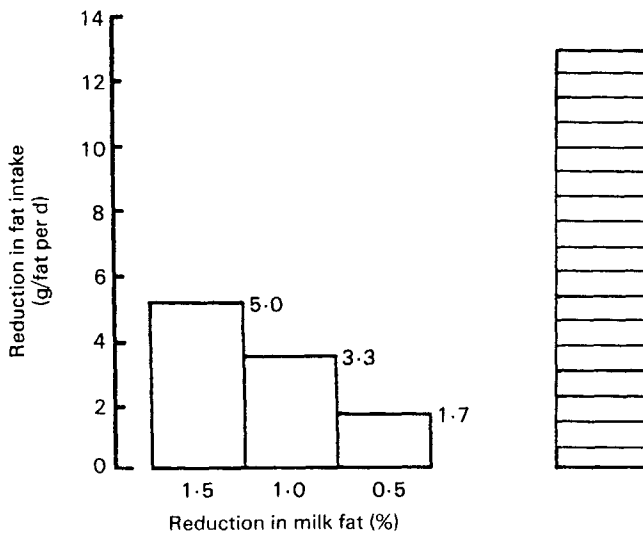


Fig. 8. □, The effect of reducing milk fat by processing. ≡, Reduction in fat intake recommended by the National Advisory Committee on Nutrition Education (1983).

The various nutritional manipulations which could be used to reduce butterfat are well documented. Increasing the cereals and reducing the roughage proportion of the diet, grinding the roughages, or the addition of propionic acid would all increase propionate in the rumen and thereby reduce butterfat, but each of these would increase the cost of milk production and, because of quotas, farmers are already looking for ways of reducing input costs.

Conclusions

The findings appear to show that the short-term NACNE recommendations could be met by the alteration of the slaughter weight of livestock and this could be done without altering the energetic efficiency of lean-meat production. There would need to be a change in the application of the present-day subsidies, particularly in those for lambs which tend to favour high live-weights at slaughter, which are associated with high fatness.

Further reductions can only be met by changes in processing and butchering methods and these will only be effective if the fat is subsequently withdrawn from the human food chain.

There seems to be little opportunity to reduce the consumption of butterfat from the dairy industry. The reduction of butterfat in milk by selection of breeding stock is likely to be a long-term process, and the manipulation of butterfat by nutritional means would increase farmers' costs. There is an opportunity to increase the sales of skimmed and semi-skimmed milk under a 'healthfood' label.

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