Second European Conference on Food and Nutrition Policy

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TNO Nutrition and Food Research, Zeist, Netherlands
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Food and Nutrition Policy in Europe

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D.G. van der Heij, M.R.H. Löwik and Th. Ockhuizen (Editors)
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Welcome on behalf of the Dutch government

H.J. Simons

State Secretary of Welfare, Health and Cultural Affairs

Dear participants, dear guests

It is a great pleasure for me to welcome you in the Netherlands to this WHO European Conference on Food and Nutrition Policy. It is gratifying to see that so many participants from all over Europe, and even beyond Europe, are showing their interest in this important field, which concerns every citizen in our respective states. You have assembled to start the second conference on this subject in Europe. The first conference, organized by the WHO Regional Office for Europe, took place in 1990 in Budapest. In that Conference the status and future developments of food and nutrition policies in the European Region were discussed. It was a successful conference which is now being given a follow-up. We hope to learn important lessons from national experiences in the implemention of nutrition policies.

At many occasions the importance of the relationship between nutrition and health has been stressed. Good nutrition yields better health as regards diseases related to affluence. The assessment and implementation of a nutrition policy is therefore an important part of a protective health policy. A balanced nutrition is one of the factors with a preventive effect on many diseases.

Surveys have shown that consumers are aware of the importance of a healthy diet, but at the same time they seem to believe that the presence of 'chemicals' in food is the greatest risk to health. In the Netherlands' Nutrition Policy Document, which is the basis of our present nutrition policy, both aspects are discussed and the conclusion is drawn that a healthy choice of food is the most important factor from a health point of view. This Nutrition Policy Document was approved by the Parlement already in 1984. From that time on we have had in the Netherlands a politically supported nutrition policy which consists of two main elements:

– to ensure the safety of foodstuffs, and
– to promote healthy eating habits.

The first item, food safety, is mainly covered by legislation, which for the Netherlands is nowadays largely based on EC legislation. Of course, adequate inspection and control is also an important instrument to ensure that the available food is safe for the consumers. Without reservations I can, for instance, advise you to try a raw herring, which you can buy in the streets and which is a typically Dutch and at the same time a healty food item.

From a health point of view unbalanced food habits have contributed to the decline in health conditions of many people in the Netherlands. Our nutrition surveillance programme has shown us that our daily food consumption patterns differ from what nutritionists advise as a prudent diet. The attempt to change food habits is therefore an important issue in our national nutrition policy. This does not alter the significance of food safety but brings it in the right perspective. I think this will be the case in almost all European countries. Hence, the attention in this conference is focused on the implementation of a food and nutrition policy on a local, national and European scale, the main goal of this policy being to bring about changes in dietary habits.

In the Netherlands many activities have been undertaken since 1984 to implement the formulated policy. As a first step, measures were taken to obtain the necessary data for targets and priorities to be set on a scientifically sound basis. This resulted in the establishment of a Nutrient Database, and in a food consumption surveillance in a representative sample of the Dutch population in 1987. This surveillance will be repeated this year. The integration of various aspects of the relationship of nutrition and health resulted in the 'Guidelines for a Healthy Diet' which were established by our Nutrition Council. After these basic measures, general consensus was reached on the first priority of reducing fat consumption, particularly that of saturated fat. This was and is our first nutrition goal. We are currently trying to reduce fat intake through a nation-wide campaign. We have set up a Steering Committee for healthy nutrition. The members of this committee are representatives of the national government as well as consumer organizations, the food industry, supermarkets and public health services. This unique form of working together has resulted in a successful campaign. The goal of the campaign is to reduce fat consumption by 10% within 4 years. You will hear more about the activities to reach this objective during this conference.

It is my opinion that we are just starting our efforts to improve our nutrition and that there is still a long way to go. Obviously, the recommendations of this conference will provide important guidance for future work.

In the Netherlands many organizations are working together in the field of nutrition. In December 1991, five important organizations were brought together in one building called 'Voedingscentrum', the Nutrition Centre, which can be found right across the street of the Congress Centre. These five organizations, which I will not sum up but which all cover one or more aspects of our nutrition policy, are undertaking many activities in support of the formulation and active implementation of our national policy. On Wednesday there will be an opportunity to visit the Nutrition Centre, and to drink a glass or two during the reception offered by the said five organizations.

Nutrition policy can no longer be seen as a purely national affair. This conference is an illustration of this fact. As all European countries are facing similar problems, they can profit from the experiences from others. WHO can play a role in stimulating Food and Nutrition Policies and exchanges of view as is done in this conference.

Since the European Committee has enlarged its scope and field of activities in the agreement of Maastricht, comprising health (and disease prevention in particular) in its mandate, the EC Commission might also take up a role. The so-called subsidiarity

principle will probably confine this role to the coordination of the basic principles for healthy nutrition and an exchange of views on the activities carried out in the member states. Nonetheless, we may witness an inceasing role of the EC in the field of nutrition. The role of the EC in food matters is of course well established over the years, as can be seen from the important legislative activities to create a free and safe internal market for foodstuffs.

I have understood that the cooperation in organizing this conference between WHO, TNO Nutrition and Food Research and our Ministry has been most stimulating. Other bodies and persons have worked hard to arrange an interesting programme. I would like to thank them all for their diligence and support.

I wish you a very pleasant stay in the Netherlands and hope that you have some time left to look around. As I noticed in the programme there will be time to visit the World Horticultural Exhibition 'Floriade 1992', which was opened earlier this month by our Queen Beatrix.

I hope to see you again at the end of this day at the reception in the 'Gemeente-museum', which is practically next door to this Congres Building. For nów I wish you a very informative and successful meeting.

The Alderman for Social Services, Welfare and Health Care of the city of The Hague will now take the floor to give you more information about the city of The Hague.

I hereby declare this conference opened.

Welcome on behalf of the city of The Hague

D. Ramlal

Alderman for Social Services, Welfare and Health Care

Ladies and gentlemen

I bid you welcome in the city of The Hague. In selecting a site for this conference you have made a fine choice: here you find our national government, just in case you wish to take conclusions resulting from this conference up with the Dutch aüthorities; here you find most of the embassies, a safe idea just in case you get involved in serious troubles; here you are in one of the Netherlands' green cities – the only one by the sea – a nice idea just in case you experience a black-out; here you have an ample offer of high-quality food in all varieties. Just make your choice and dive in: our city is yours for the whole duration of this Conference.

I can warmly recommend to you a visit to the Floriade, an event of world fame. This horticultural exposition is organized once every ten years. This third Floriade is being organized by the cities of The Hague and Zoetermeer. Although one day will not suffice to overview this eldorado of flowers, plants and allied items even half a day will offer you a wonderful recreational experience.

In an attempt to subdue somewhat your enthusiasm and to prevent you from changing collectively this hall for the inspiring ambiance of the city or the Floriade, I will now return to the subject of your Conference.

Europe is integrating. Humanitarian reasons are enough to make it essential to tune in food and nutrition policy. A common opinion is that tuning of policy in this area actually implies that western Europe shows the rest of the continent how things should be done. I am sure that this idea is a delusion. My daily experiences show that our welfare state generates its own shortcomings, even nutritional ones. Let me give an example.

Pupils of some primary schools in The Hague have been found to suffer from loss of concentration. Investigations have shown that an impróper nutrition and night's rest were the primary evildoers.

1. A popular TV soap series had been programmed later in the evening. One of the consequences of this postponement was that kids aged six or seven went to bed as late as ten o'clock. The morning after some of them slept in school.
2. An alarming proportion of schoolchilderen was found to spend their school day without wholesome food. For the majority of these children the milk supplied in

school was the first nutritious food they got. The lunch of many of them was richer in sweets and candy bars than in bread or fruit.

The city council of The Hague considers such a situation unacceptable. Although we do not desire to act as controlling authorities we consider it as our duty to offer the inhabitants of our city all necessary means to exist and develop as full citizens. Education and health care are among the tools needed to achieve that goal.

To fight the sleep and nutrition problems mentioned we have started the project 'A good start for a new school day'. We have recently, together with the Department of State Secreary Simons, got acquainted with the project. The parents' councils and the teachers are acting as go-betweens to alert the schoolchildren to the importance of adequate night's rest and adequate nutrition. Practical advice is given. Nutritional education has been integrated in the schools' curriculum. Further, the subject comes up on a regular basis in school papers, parents' evenings, local newspapers and other media and in personal talks.

The first results of the project are encouraging. However nobody should think that our goal has already been achieved. The present western society has its advantages and its drawbacks. We must utilize the advantages, for example those of technology. The drawbacks must be reduced as far as possible. Soap series, video recorders and computer games must help us develop as full and responsible citizens rather than impede our development.

In-depth analyses of problems of this nature are just a first step. It is the results that count. That is why you meet these days. There are ample reasons to wish you an inspiring and successful conference.

Opening plenary session

Challenges for applied nutrition sciences for the 1990s

W.P.T. James

Rowett Research Institute, Aberdeen, UK

Introduction

Applied nutritionists have to be involved in a wide range of activities because they play a key role in ensuring that nutrient goals are developed, interpreted and implemented appropriately. The validity of current goals needs to be defended whilst recognizing that knowledge of the relationship between diet and health is very incomplete. Current knowledge amply justifies quantitative average population goals. Translating these nutrient goals into appropriate dietary guidelines for specific groups, such as children and individuals, has not been adequately emphasized and provides opportunities for vested interests to block the effective application of these nutrient goals.

The nutritionist has to ensure that a health perspective is applied to agriculture and food policies. These have developed with government support and now often exert a substantial influence on consumer choice. The free market in food does not exist in Europe and would have to be perfect, with remarkable consumer education, to be appropriate. Alternative strategies to combat current market distortions have to be developed.

Novel methods for monitoring food intake are needed, new European surveillance of dietary patterns is essential, and current food labelling continues to be geared to regulatory needs, not to consumer understanding. Novel approaches are therefore needed.

Before considering what the challenges may be over the next 8–10 years for those involved in the applied nutritional sciences, it is perhaps useful to distinguish between the strategic and applied sciences of nutrition and to recognize the differences between nutrition and dietetics. Since this second European Conference on Food and Nutrition Policy is to concentrate on the phase of implementation, then it is also appropriate to consider how the nature of nutritional science differs from that of policy-making. I am not concerned with the need to re-assess endlessly the nuances of definition, but to set out clearly what each of us needs to consider when asking what nutrition has to contribute to implementing the new policies on diet and health which are now accepted throughout Europe.

Basic, strategic and applied nutrition

Basic nutritional science deals with studies which attempt to find out about the nature of nutrients and their interaction with tissues and cells. For example, somebody might be intrigued by the conformation of a complex carotenoid derived from a toxic plant and how this carotenoid might 'pack' into the membranes of cells from any part of the body. The study is done without regard to any particular biological process which could relate to something of practical value. This research is then 'basic'.

'Strategic' nutritional science is, however, very different because in this case it involves the study of the critical processes which may be involved in, for example, the body's defences against free-radical damage. To this end it could require detailed studies of the relative importance of different carotenoids, ubiquinones, tocopherols and tocotrienols derived from plant foods in scavenging free radicals and thereby minimizing free-radical damage occurring in the lipid phase of membranes or other lipid structures, such as circulating lipoproteins. The studies might well be aimed at finding out the relative importance of each lipid-soluble scavenger. Having established that perhaps ubiquinone is the first defence against free-radical attack, the 'strategic' researcher would then proceed to establish the body distribution, mechanisms of absorption and catabolism of the ubiquinone.

The 'applied' scientist then has to cope with assessing all the practical implications of these findings. It becomes important to know the relative contribution of different foods to ubiquinone, carotenoid and vitamin E intake and then to consider how to specify an adequate level in the diet. For example, one problem is how to know whether the intake of vitamin E is appropriate and how the levels of vitamin E or ubiquinone vary within a population. These data then become of value in policy-making (see below).

Dietetics deals with the practical application of nutrition to the foods eaten by individuals or groups within a society. It therefore includes menu planning and practical culinary skills as well as encompassing a range of behavioural issues aimed at helping with the treatment or prevention of nutrition-related problems. Dietetics is therefore very involved in practical food issues in relation to nutritional needs.

Applied nutrition science and policy-making

Applied nutritionists are in an unenviable position because inevitably they have to deal with every aspect of diet in relation to health as soon as they become involved in policy-making. They must therefore not only be knowledgeable but capable of interacting with a wide range of scientists from other disciplines. They often become largely responsible for policy implementation and have to bear the brunt of criticisms from consumers, other scientists, food industrialists, farmers and legislators, many of whom have a vested interest in ensuring that the policy is either implemented slowly or not at all.

Table 1 lists some of the activities of the applied nutritionist. Each item will be

Table 1. Tasks of applied nutritionists in the 1990s.

1.	Assessing nutrient needs in relation to health.
2.	Devising new methods for assessing nutritional status.
3.	Developing simplified systems for monitoring dietary patterns.
4.	Integrating knowledge to produce either population or individual goals.
5.	Translating crude population goals into individually relevant dietary guidelines.
6.	Promoting a health-related agenda in agriculture/food processing/economics.
7.	Combating ignorance, prejudice and cynicism of pressure groups frightened of change, e.g. governmental, UN agencies or vested interests, e.g. sugar, fats and oils industry.
8.	Devising means of monitoring implementation programmes.
9.	Stimulating health promotion in policy implementation.
10.	Ensuring scientific validity of health education material.
11.	Reassessing the validity of current goals/RDAs.
12.	Bringing toxicological assessment of diets into a nutritional and scientifically robust context.

considered, but first we have to recognize that in 1992 the applied nutritionist in Europe has made important advances. These new ideas are still being questioned and indeed thwarted by other groups. Since the current debate is a valuable illustration of the challenge facing the applied nutritionist, these issues will be considered first.

Table 2. World Health Organization's proposed nutrient goals.

	European 1988		General 1990	
	intermediate	ultimate	lower	upper
Complex carbohydrate (% energy)	>40	45–55	50	70
Protein (% of energy)	12–13	12–13	10	15
Sugar (% of energy)	10	10	0	10
Total fat (% of energy)	35	20-30	15	30
Saturated fat (% of energy)	15	10	0	10
P/S ratio	<0.5	<1.0	–	–
Dietary fibre (g/d)				
as NSP	–	–	16	24
as total fibre	30	>30	27	40
Salt (mg/day)	7-8	5	0	6
Cholesterol	–	<24 mg/MJ	0	300 mg/day
Fluoride (mg per litre water)	0.7–1.2	0.7–1.2	–	–

NSP, non-starch polysaccharides; –, not specified.

European nutrient goals

These are set out in Table 2 together with those devised in the latest global WHO report (WHO, 1990). The goals are very similar and, when proposed, they induced relatively little controversy except insofar as sugar is concerned. It would be futile to go over this ground were it not for the fact that there are still objections to the idea of goals. One of the first challenges therefore facing the applied nutritionist is to cope with and counter the wave of adverse criticism now emerging against the concept of quantitative nutrient goals. We need to identify why there are these objections.

Dietary goals are consistently being specified for reasons other than the prevention of chronic diseases. For example, nutritionists have been involved in developing recommended dietary allowances (RDAs) for purposes of planning and even of monitoring the appropriateness of diets. There is currently a major effort underway in the European community to develop a Europe-wide set of RDAs for use in food labelling. It is characteristic of the European Community that there is intense pressure on committees to develop EEC-wide standards because they will ease the problem of the food industry attempting to sell their products throughout the Community. This is considered of much greater importance than nutritional issues relating to health, so the scientists are asked to specify RDAs when there are hardly any scientific data to justify the levels chosen. Yet some of the same scientists and administrators wax eloquent in their denunciation of dietary goals whilst meekly acquiescing to industrial and governmental pressure to produce fudged figures for the benefit of selling different food products. This approach to labelling also neglects the fundamentally misleading nature of current approaches to labelling (see later). Thus, one of the principal challenges for European applied nutritionists is to ensure that their skills are not misused by the European Community. The Community needs, as part of its social charter, to take public health into its list of responsibilities and nutritionists should advocate this new course of action.

Toxicology and nutrition

Another arena of public interest that impinges on applied nutrition is that of food safety and toxicology. Nutritionists tend to be intimidated by pathologists and toxicologists who look askance at the lack of nutritional information. Toxicologists, however, consistently delude themselves about the validity of their policy-making since they apply simple rules based on animal tests and histopathology and extrapolate to the likely consequences of specific toxicants in the human diet. No long-term animal studies are conducted, and the diets used in the tests in no way resemble human diets. Multiple toxicants are not assessed for their interaction and no account is taken of possible chronic metabolic effects. After spending many years on the UK's expert committee on toxicity, I agree with the recent UK government report which specifies the need to develop more relevant toxicity tests which take account of the modern approach to nutritional science. This approach is concerned not simply with

acute deficiency disease, but with the long-term metabolic effects of sustained intake of nutrients, anti-nutritional factors and other dietary bioactive molecules. The challenge for nutritionists is therefore to ensure more meaningful developments in nutrition-related toxicology.

Why population nutrient goals?

For 40 years we have all been brought up with the concept of a 'balanced' diet, which is seen as the method of avoiding deficiency diseases. From before the Second World War efforts were made to quantitate both nutrient goals and dietary goals. Thus we were told that men need 12.2 MJ (2900 kcal) per day whereas women need 9.0 MJ. We should all eat up to 84 g of protein if we were to grow well and remain healthy, and pregnant women would need more than normal women. This was documented and specified as relevant to individuals with only limited reference to the fact that energy and protein requirements vary widely between individuals. Quantitative dietary recommendations were even more prescriptive in Britain with children, nursing and pregnant women being provided with the same specified volume of orange juice or full-cream milk each day, despite the highly variable needs of the different groups. Yet the old men of nutrition, industry and government who currently castigate quantitative goals are strangely quiet about these ancient practices and the current approaches to RDAs, which they have always taken for granted. Their excuse is that these proposals were developed to counter the threat of deficiency diseases and not the chronic diseases of adult affluence which they pejoratively and incorrectly ascribe to over-indulgence and lack of self-discipline.

We should recognize that average population goals were established quantitatively first by FAO. FAO (1977) produced a report on fats and oils which specified that 30–35% of energy should come from fat, that saturated fatty acids are responsible for inducing coronary heart disease (CHD) and that 10–12% of energy should be provided by polyunsaturated fatty acids. This report was for global use and was the first international report to apply quantitative goals universally. It is therefore greatly to the credit of FAO, with its long-standing relationships with the agriculture and food industries, that they pioneered the use of nutrient goals in an international context.

A reasonable objection to nutrient goals is that they are misinterpreted when applied to individuals. This is true, but this is no reason for abandoning goals. The problem is made more difficult because some expert groups, for example in the UK, also confuse population and individual goals. Thus the 1984 UK report on prevention of heart disease specified that nobody should have a fat intake that exceeds 35% of energy (Department of Health and Social Security, 1984).

A further objection to quantitative goals is that they are arbitrary and bear little relationship to what might emerge were the goals to be specified scientifically. This objection fails to recognize that a goal may be developed simply because the proper goal would demand a change in national diets which is deemed impractical in the immediate future. This explains the choice by the Nordic (Nordic Council of Ministers, 1989) and UK governments of the 35% total fat and 15% saturated fat

goals. Unfortunately, this widely recognized feature of dietary goals easily leads to the assumption that every other goal is arbitrary. The European WHO report was explicit on this point when setting interim and ultimate goals, but the derivation of ultimate goals has true scientific validity. Three examples should suffice: (a) the new fibre goal, (b) the sugar goals and (c) the choice of lower as well as upper population goals.

The fibre goal

There is a clear linear relationship between the intake of non-starch polysaccharides (fibre) and its laxative effects (WHO, 1990). The nutrient goal was then developed by recognizing that people with a faecal output below 100 g/day usually complained of constipation. Since the SD of the effect of fibre on faecal output was 10–15%, it was estimated that the average faecal output of adults needed to be about 150 g simply to ensure that only a small proportion of the population had constipation. The fibre value needed for an average faecal output of 150 g/day in adults then had to be converted to an overall population value, because the population consists of children as well as the young adults on whom Cummings undertook the studies which led to the fibre goal. I used estimates of the energy requirements of the men and women taking part in these physiological studies to translate the values on a g fibre/MJ basis to average population figures. This represented a more sophisticated approach by the WHO group of experts than had been used hitherto. We already knew that Cummings and his colleagues were finding a curvilinear relationship between the incidence of colon cancer and the average faecal output of the population, but we kept clear of such general associations by relying simply on physiological data in relation to the problem of constipation.

Sugar goals

In Geneva, the WHO Expert Consultation group took particular care to reconsider the sugar issue since we knew that some industrial interests had tried to ridicule the goals chosen in our European Report (James, 1988a). We therefore commissioned new papers to assess the quantitative goals. This showed that the European arguments remained valid. Despite this effort and the ease with which the expert group concluded that epidemiological, clinical and experimental evidence justified a 10% goal for refined sugars, vested interests were immediately brought into play before the report was even published (see later). We then observed another feature of campaigning by vested interests since we were accused of stating that sugar was a cause of heart disease, diabetes, etc. In practice, no such statement was made or implied and the sole basis for specifying and calculating the level of the sugar goal was for the prevention of dental caries since this shows a clear relationship to sugar intake. Misinformation campaigning is a characteristic of lobbying by vested interests, as has been beautifully illustrated by Taylor's analyses of the unscrupulous methods of the tobacco industry (Taylor, 1984).

Lower and upper nutrient goals

These were specified explicitly for the first time by our WHO report in 1990 for the simple reason that we had a responsibility to consider the dietary issues in relation to health throughout the world. The British Consumer Association, with the help of Cannon (1992), has just published a collation of 100 reports from all over the world which demonstrates that several developing countries have had to establish dietary goals as they move from a state of deficiency to acquire the unfortunate effects of Western investment in fast food and fat consumption. The lower goals (e.g. 15% fat) were based again on FAO's original fat report, taking into account the need for some energy concentration in the diet, particularly in children. Cannon's report notes the worrying evidence of chronic diseases, such as hypertension and CHD, emerging in South America, Africa and Asia, but we can still expect emotive objections from scientists who have spent their lives combating deficiency diseases in the Third World. They are offended in some odd way that these new diseases should be highlighted when they continue to battle for the elimination of deficiency diseases. The challenge for European nutritionists is to support Third World countries in their efforts to establish 'primordial' prevention, i.e. prevention of life-style changes which will lead the population into risk.

The lower goals cited by WHO sometimes included a 0% value. Clearly in relation to sugar it was possible to have a diet with no refined sugar at all and this might well be a very healthy diet. Since refined sugar is an unnecessary item in the diet, we therefore specified the lower goal as 0%. This led to a furious outburst with a mis-interpretation of the concepts and intense lobbying of WHO by 40 countries who contacted Geneva before the report had even been through the Executive Board. The poor developing countries were misled by being told that their economies would suffer if WHO agreed to our report since world sugar supplies would need to fall. Although untrue, such a rationale would imply that WHO should not make any statement with economic implications, for instance about smoking and its lethal effects.

The responsibility of WHO is to specify the health goals even if the truth is unpalatable. How the health goals are to be achieved then requires additional agricultural and economic input. However, the idea that countries are forever dependent economically on single cash crops is naive and misleading. In practice, there are numerous strategies for dealing over a decade or so with the inappropriate crops grown in any community. The problems of world development are also immense and the North/South divide in terms of funding is of far greater significance than any supposed damage resulting from a WHO expert group however far-reaching the eventual effects of implementing its reports.

These issues are set out in some detail because one major challenge for the applied nutritionist is to maintain the consistency of current recommendations against attacks by vested interests or, indeed, by confused or manipulated doctors and nutritionists who often seek to quibble for detailed but relatively unimportant scientific reasons or to please their paymasters. For example, doctors readily become obsessed by the genetic basis for individual susceptibility to disease and attach much greater

importance to high-risk strategies for selected subgroups of the population than is warranted scientifically. The individual clinical approach is understood by the media but reflects a very different strategy from that required by public health nutritionists who need to recognize, as Rose has emphasized, that Northern European populations as a whole are at risk and there is a need to take the population approach to prevention (Rose, 1981).

The population approach, spelt out by WHO in relation to cardiovascular disease in 1982 (WHO, 1982), was incorporated into general use by WHO in the European (James, 1988a) and global reports (WHO, 1990). The applied nutritionist needs to recognize the need for shifting the distribution of populations when trying to improve public health.

Re-evaluating current goals

One of the problems with current goals is that they can only reflect the best available evidence and there are many gaps which critics can highlight. Thus, for example, we now have in the UK a plethora of articles questioning the role of cholesterol in CHD and suggesting that dietary interventions are dangerous or ineffective. The British culturally provide ample evidence of being an isolated island community full of argumentative academics who seem to be better qualified in iconoclastic argument and adversarial debate than in productive consensus-building for improving the health of the population! It is now emerging from European trials for preventing CHD that much of the concern about intervention trials relates to drug trials, not dietary trials. If drug trials had to undergo the rigorous criticism applied to dietary intervention, few, if any, drugs would be introduced. A drug that lowers cholesterol or blood pressure without causing immediate toxicity in animal or short-term clinical trials is readily accepted as worthy of widespread application. Yet dietary intervention induces extreme adverse criticism from both clinicians and even some nutritionists who demand total proof of efficacy in terms of mortality before any policy is developed. Given the remarkable range of data already available and the high risks of disease, for example of CHD, in Northern Europe, the burden of proof is on those who seek to allow the unfettered adverse changes in diet since the Second World War to continue. The recent long-term data from Norwegian trials and the remarkable Indian trials on diet intervention alone suggest that dietary intervention is not only safe but highly beneficial in reducing both cardiovascular and total mortality.

These new reassuring trials do not mean that all the dietary factors leading to CHD have been identified. Only about half the risks of heart disease can be related to smoking, high blood pressure and high blood cholesterol levels. The other half remains to be identified, so the need to add to current goals is likely but will depend on new coherent evidence being produced. The challenge for the nutritionist is to explain this issue, maintaining the current line and countering the glib assertion that we are always changing our minds.

One of the challenging new developments will be interest in vitamins and minerals as antioxidants and how these interact to prevent heart disease and cancers. The WHO

(1990) specified a quantitative goal of 400 g from fruit and vegetables because the data were insufficient to specify preventive levels of nutrients, but the evidence was sufficiently strong to propose that adequate intakes of vegetables and fruit were conducive to long-term health. We therefore estimated intakes for the European Mediterranean countries with the help of FAO's representative and provided a dietary rather than a nutrient goal; this is one of the first generic dietary goals to be introduced since the early 1940s when milk goals were set in Britain. It recognizes that there may be many protective factors in vegetables other than the antioxidant vitamins, but one of the issues will eventually be to define these protective factors comprehensively.

Translating population goals for practical use

One justified criticism of nutrient goals is that they are impracticable. Few nutritionists seem to realize that the goal is not individually prescriptive. If we are concerned with distributions, then a 30% fat goal means that some individuals will have an intake of 25% and others of 35%. If the former UK goal of 35% fat , now changed to 33% in the DRV report (1991), is applied to everybody, then with 75% of the population having an intake above 35%, the UK government was advocating an immediate change for everybody to reduce their fat intake to below 35%. This effectively would mean a massive shift in dietary patterns. This was justified because it simply applied to individuals on a high fat intake and the prescriptive approach was readily understood. A population approach was, however, considered as social engineering and potentially dangerous because doctors worried that British people on a low intake might be harmed by a further reduction. This misunderstanding is typical of the naivety of some medical experts who are not only unused to thinking in population terms but have no real understanding of the dietary patterns of their population. Practically nobody in Britain was eating less than the upper WHO goal of 30% fat when the British committee was so worried about a section of society who might be already on a low-fat diet.

Special groups

Applied nutritionists need now to reinterpret the salt and fibre goals for use by special groups, for example children and the elderly. The different needs of men and women must also be considered. For example, we showed some time ago that women take less salt than men simply because they eat less. In Britain men were eating 10.6 g of salt, whereas women ate 7.4 g per day (Sanchez-Castillo et al., 1987a). A 5–6 g goal cannot be applied directly to children who eat less than women. The sensible policy is therefore to express salt intake on an energy basis (e.g. 0.5 g/MJ), taking the reference energy intake as 10 MJ.

Similarly, fibre intake needs adjusting. It is nonsense to suppose that children should consume over 30 g fibre or 22 g non-starch polysaccharides when these values

were derived from studies in young adult men. By relating fibre intake to energy, we can calculate children's fibre intake as g/MJ dietary energy. This then is the next challenge for nutritionists: to reinterpret the nutrient goals such that they are relevant to particular sub-groups within the population.

The problem of nutritionists' muddled thinking

Some rather old-fashioned nutritionists and dietitians are still fond of repeating the adage that there are no good or bad foods, only less healthy or more healthy diets. These dietitians are a gift for those sectors of industry which seek to ensure that we continue to purchase our current inappropriate range of foods. It is important therefore to develop individually relevant guidelines which are meaningful. Thus the old advice from the US Department of Agriculture and the UK government to enjoy our food and eat a variety of foods seemed both true and reasonable. It was also, however, a useful response when coping with the fear that to specify clearly a quantified reduction in sugar, butter, cooking oil, biscuits, cakes, sweets and chocolate as a desirable conception would immediately antagonize vested interests with powerful lobbies. These lobbies retain a substantial number of Senators and Parliamentarians to protect their interests.

The effects can also be subtle. For example, it is well known that currently a substantial investment is being made by some industrial organizations to ensure that as little of the concepts underlying nutrient goals as possible emerges in the reports for the 1992 WHO/FAO International Conference to be held in Rome. It is embarrassing to see the focused attention which some elderly advisers give to ensuring that the old-fashioned approach is maintained.

This is important because the European food industry could be in danger of being classified as partisan and acting against the public interest. The food industry is well able to respond to the consumers' need for healthy food with the development of products low in fat, sugar and salt. The European food industry is amazingly diverse, but the large companies are in a powerful position. They are guaranteed to survive if they adapt to consumers' needs, but they will be handicapped if they allow their representatives to be influenced by commodity interests such as the sugar industry. Nutritionists must therefore continue to help the multi-product food firms to combat the pervading interests of those industrialists representing a single commodity such as butter, or the vegetable oil industry.

Nutrition and health education

This is emerging as a big challenge for the applied nutritionist, although the dietitian may consider the problem as more relevant to their own field of interest. Surveys now demonstrate that in Britain or Eastern European countries over 70% of adults recognize the links between fat intake and heart disease and wish to avoid the problem. The transmission of facts in simple terms is therefore accomplished. Yet we

still persist with the simple assumption that all we need to provide is information about the link between diet and disease for adults to change their behaviour. Manifestly this is wrong because heart disease remains very high in Britain and there is clear evidence of deteriorating health in such countries as Hungary, Czechoslovakia and Poland.

Nutrition education, I suggest, now needs a complete revolution. We have been providing general information which is useful background but does not constitute what is required for effective change to take place. Without quantitative goals relating to specific foods, people will have little or no idea what is being meant by any of the general advice given. We have recently developed both simple targets for specific food items consumed daily in Britain and guidelines for monthly purchases for people living in Britain (James & Ralph, 1990). Nutritionists need to assess whether these targets are valuable in practice and whether the concept can be extended to other parts of Europe. This is a challenge requiring a good understanding of nutrient and energy requirements and the practicalities of consumer understanding.

Food labelling

We have all accepted that food labelling is of use to legislators and food regulators who seek to establish minimum standards for food composition. Current food labelling is, however, almost completely useless for the general public. Many of us have known this for years, but only recently has this been documented effectively. For example, in Britain surveys, conducted by the Coronary Prevention Group (CPG, 1992) and the Consumers' Association in conjunction with the Ministry of Agriculture, have shown that the general public is completely confused by food labelling. The facile response of legislators and some food companies is that therefore what is now needed is more public education. This is both nonsensical and impractical. A simple examination of what is now required of consumers shows that they need an excellent command of nutrition, a knowledge of each family member's metabolism and a computer with novel programs and databases before it is possible to enter a supermarket to purchase a healthy diet based on the information on food labels. To suggest more public education in the current format is therefore to be considered either ignorant or foolishly obstructive of new developments in food labelling.

Such strong criticism needs an explanation. If one takes two consumers, one a 25-year-old male rugby player of 80 kg and the other a 65-year-old woman weighing 50 kg, they may both be advised to eat less than 30% of energy from fat as one of the criteria of a healthy diet. How then do they work out their food purchases? All foods should now be labelled in the current manner with their fat content in g/100 g. But how does anybody convert the portion weights of food purchased for eating on one day to the g of fat provided before adding all the items to be purchased for the day or week together to give the final total intake? The conversion of daily energy needs to fat energy and then to total grams of fat per day for relating to individual food items is, in practice, impossible for all but the extraordinarily obsessed. If, miraculously, the consumer accomplishes this feat of manipulation, what is 30% of the old lady's or

young rugby player's energy requirement? This can be estimated readily by me from their sex, age and weight (James & Schofield, 1990), but nobody has yet heard of this approach! The estimate is still in error by up to 2 MJ or 16 g fat per day, but the latter error may be acceptable if everybody is given the advice to eat the population average goal, so that the errors incurred are therefore encompassed within the distribution desired for that population. If the rugby player has a genetic sensitivity to saturated fats in the diet and is advised to reduce his high cholesterol intake (advice which, on a cholesterol basis, should apply to over 90% of the middle-aged in Scotland if they followed European guidelines), then he will find it very difficult to follow the medical advice properly.

No government or academic body in nutrition has yet faced up to this problem. Clearly it is the job of the applied nutritionist to devise a new system. This the British Coronary Prevention Group has done (CPG, 1990) and the approach was developed as an annex in the WHO global report. The method is based on a new understanding of energy requirements and the concepts are somewhat advanced even for many nutritionists. Another challenge for nutritionists is to assess the validity of this new proposal and its application throughout Europe.

The nutritionist as an advocate for change: distorted markets

Throughout Europe we are in the midst of extraordinary change with one dominant theme – the free market. With the collapse of communism almost everybody is agreed that a free-market approach to agriculture, food production, processing, distribution and retailing will produce an efficient and consumer-responsive system. What is not recognized is that throughout Europe we have not had a free market for years. In Eastern Europe the farming and food industries have been under the total control of the state, but in Western Europe we have only been fractionally better. There continue to be huge subsidies which distort the whole financial structure of agriculture. Nobody has ever looked at the health implications of these subsidies and regulations. The subsidies and the free research and development, targeted, for example, to help milk, butter and meat producers, have led to the plentiful production of cheap foods with a high fat content. The state-paid extension services assure farmers that they keep up with all the modern advances. This ensures that their pre-eminence in the market place is retained. Cartels and monopolies have also been developed with state support, for instance through the British Milk Marketing Boards, which now have multimillion ECU turnovers. These Boards, together with their subsidiary or dependent promotion councils, consistently bombard the public with advertisements for cream, butter and fatty meats. Other huge firms barrage the public with advertisements for confectionery and baked products. The total spent on food advertising in the UK in 1988 was 570 million pounds compared with 1 million by the Department of Health on food-related health education (Lang, 1992). Is this a free market? Advertising should, of course, be permitted in any free society, but the preferential market share of many of the companies has been systematically developed with huge capital grants and recurrent state subsidies. To now liberate the public from these systematic distortions of the

market place will allow the free market to maintain the distortion.

I am not providing solutions to this problem, but believe that it is a major issue which nutritionists should evaluate with their colleagues in economics and marketing. Without formal analyses, the vested interests will either ignore or attack such propositions. Currently I see no evidence of a fundamental reappraisal by any European government of the health impact of previous agriculture and food policies.

Is the free market the solution for healthy nutrition?

For anybody to ask such a question immediately stimulates questioning about their political position because prevailing attitudes are so limited by the almost universal assumption that the free market together with appropriate public education is the answer to our diet and health problems. Since I became involved in government policy-making nearly 20 years ago, I have slowly been forced to change my views from those of a radical free marketeer. For many years I have had the privilege of being a member of the British Food Standards Committee (FSC) – which later became the Food Advisory Committee – and of the Toxicity Committee of the Department of Health. Only many years later did I resign on realizing that the Scientific Committee for Food in Brussels was duplicating our assessments and had the right to overturn our conclusions. We were therefore being left as scientific advisers to the British government negotiators in Brussels: the UK fielded civil servants (including their retired colleagues) rather than independent scientists as provided by other European countries. So we were only having an indirect influence on the key decision-making process. Nevertheless, in my early years on FSC, I witnessed the free-market approach to colours, preservatives and additives added to food. I concluded that these additives were set to increase to an extraordinary extent for a fascinating set of reasons.

Any industrial food group could ask the FSC for permission to use, say, a new mauve dye in cake mixtures or confectionery on the grounds that they needed a new mauve colour to cope with a new process involving high temperatures and pressures. The company could produce a consumer survey showing that groups of children preferred mauve cakes (which were preferably very sweet etc.) to alternative cakes which were perhaps of a dirty brown colour. My industrial colleagues specified that the 'need' for this mauve dye was clear so we should refer the matter to the Toxicity Committee for an evaluation of its safety. Weeks later I was confronted in the Toxicity Committee with rat data showing that feeding trials had found that the rats grew on their rat chow diet as well as their litter mates despite eating the dye in much higher amounts than that expected in children's diets. Histopathology of the rats' organs failed to show any abnormalities so, in effect, we were forced to agree that the dye had not been proved toxic. The FSC members then declared the dye safe, whereupon those of us sitting on both committees had to refute the assumption of safety; this was a different concept from that where we had found an absence of proven toxicity. The dye was therefore permitted, but FSC members grumbled that the public was resenting the use of 'E' numbers on food labels to signify additives: the public needed to be 'educated' to allow them to be reassured that all was well. We

were only able to reverse this trend when unscientific consumer pressure groups started objecting to all the additives used. Eventually they rattled the politicians, influenced the media and therefore forced the civil servants to change their philosophy. Thus began a rational reappraisal of the extraordinary range of concentrations of different colours and additives in foods. We also discovered that many of these additives had never been evaluated for their toxicity using the modern but still crude approaches. Thus consumer fears rather than scientific argument won the day and stimulated a reappraisal of our scientific methods (see later).

The saga continued when I discovered that ice creams and other supposedly delightfully healthy foods had to conform to certain food standards which required that these ice creams had a high fat content (like butter and margarine) as an indication of 'quality'. This seemed nonsensical to me because surely it was good to allow any compositional standard at all so long as the public was informed with proper food labelling? In no time, we found ourselves abolishing food standards. Lang (1992) has now revealed that, as a consequence, some unscrupulous manufacturers have reduced the expensive meat or fish components of their food products to ludicrously low levels. A recent study by Trading Standards in the UK has shown that on average the amount of meat in meat products fell from 46% under the old regulated system of standards to 31% under deregulated conditions. Lang points out that a minced beef and onion product fell from 50% to 36% meat and a chicken product from 75% to 45% meat. This suggests that deregulation is a recipe for chaos: the early Food Standards Committees in Britain introduced standards because they formed the clear view that a market-driven food industry was a major problem for the consumer. Lang has recently argued cogently for a new look at agricultural policy as a whole, including GATT, because the free market system neglects a host of environmental and health problems (Lang, 1992).

These general arguments on the free market are taken up in more detail by Cohen & Henderson (1991) in their analyses of health prevention and economics. They show that a free-market approach is inappropriate in relation to health because we are too limited in our ability to create a perfect free market. This does not mean that economic appraisal is not valuable, but often it is a government's responsibility to take a strategic national look at health and economic benefits taking into account accepted national social policies. I have presented elsewhere a similar account of the inappropriate nature of a society based exclusively on individual choice (James, 1988b). The problem is how to make most effectively use of free-market forces while preserving laws and regulations to maintain societal as well as individual benefits.

Monitoring European nutrient intakes

It is extraordinary how little we know of the dietary and nutrient patterns in Europe. We can use FAO Food Balance Sheets to gain some insight into national patterns of food use, but household or dietary studies are needed before a more refined understanding suitable for implementing policy can be gained. In the UK the government is proud of its surveillance systems. Its long-standing National Food Survey is based on

monitoring household purchases. These data have formed the principal source of information for decades despite the recognition that we had little knowledge of individual intakes, of differences between men and women or of the true total intake, i.e. taking account of food eaten outside the home. These issues seemed to be of minor importance because assessing the nutritional intake and status of supposedly normal healthy adults was the lowest priority. Now the UK government has begun a new approach which brings together Ministry of Agriculture studies on diet in the same people whom the Department of Health are studying for adiposity, blood cholesterol and other nutritional indices. The recent survey has revealed an alarming increase in adiposity in Britain and demonstrated that we have one of the highest average blood cholesterol levels in the world (Gregory et al., 1990).

Now that we recognize that whole Northern European populations are at risk, we have to begin documenting European dietary intakes and nutritional status on a systematic basis. WHO, with the help of Jaap Seidell, is currently obtaining new data on the body mass index of adults in different parts of Europe and EURONUT has been involved in trying to rationalize databases on food composition. We need, however, now to move forward to create a common format for monitoring the health and nutritional status and dietary patterns of our European states.

Northern European food companies see the Mediterranean countries as an open market since Southern Europeans eat far less processed food, less confectionery, and fewer biscuits and cakes than the British or Scandinavians. There is therefore an enticing open market for selling their products. These companies simply ignore the fact that this will be to the disadvantage of the health of our Southern European populations. I suggest it would be as well to initiate a surveillance system soon so that we can be forewarned of worrying dietary trends. There is already limited evidence of rising blood cholesterol levels in Greece and southern Italy with a rising incidence of such conditions as breast cancer and heart disease. We therefore need to start soon to document these adverse trends. This should become a priority because it is only when we have the facts that we will be able to convince governments of the need for action.

Monitoring individual food intake

Nutritionists are now concerned about the validity of the usual measure of food intake because there is increasing evidence of under-reporting when adults are asked to document in detail their food consumption over periods of a week or more. This is particularly evident in weight-conscious individuals. We must therefore begin to develop two formats for monitoring intake – one for obtaining meaningful and reliable dietary data which nutritional scientists can use for a variety of purposes, and the other one to allow individuals to become rapidly aware of their dietary pattern and what it signifies in relation to nutrient and dietary goals. New computer-based techniques offer promise including card-reading methods or even techniques based on rapid processing of bar codes on individually coded food items. We will need to develop these methods if people are to understand what it is they are eating.

Other practical research for policy-making

A host of nutritional issues emerge when one considers what needs to be done to help implement dietary change. One personal example suffices. In the late 1970s, I and others agreed that in nutrition education it was important to advise adults to reduce their salt intake by minimizing their use of table salt. A more moderate use of cooking salt might be helpful, but this was an extra piece of advice. At that stage, however, it was not clear what the principal sources of sodium really were. Obviously we could measure 24-h urine output of sodium, but we did not know how much was lost by sweat and it was difficult to know how to monitor how much of the household's salt supply was taken up by food during cooking or when salt was sprinkled onto the plate at meals. We then developed a technique for fusing lithium salt with sodium chloride and then regrinding it to produce an artificial salt which could be substituted for household salt. We demonstrated that lithium uptake into food was equivalent to that of sodium (Sanchez-Castillo et al., 1987a), that lithium and sodium losses in the skin, faeces and urine were similar and that a highly reproducible result could be obtained for tracing cooking or table salt use (Sanchez-Castillo et al., 1987b). We then applied the technique epidemiologically and, to our astonishment, discovered that 85% of salt derived from the foods as purchased (Sanchez-Castillo et al., 1987c). This indicated that we needed a completely different approach to nutrition education in the UK. These mechanisms applied to Scandinavian data too (James et al., 1987). This same approach has been used in Italy where 29% rather than 15% of total salt use was derived from cooking and table salt (Leclercq et al., 1990). There are many other practical issues which need resolving, for instance developing simple, practical measures of free-radical damage and of scavenging nutrients, of cancer risk (e.g. by monitoring DNA damage). All these scientific issues will continue to emerge, but without doubt the principal challenge facing nutritionists is as advocates of change in areas of policy where most of those involved do not as yet perceive there is a legitimate public health interest. The UK government, in a remarkable new document (Anonymous, 1991), has accepted the arguments for widespread governmental involvement in changing a nation's diets and plans to set targets for change. A 10-year battle of ideas has been won in the UK but are we going to win at a Brussels level so that we can have EEC-wide initiatives? The challenges are many.

References

Anonymous, 1990. Health of the nation: a consultative document on health. HMSO, London.

Cannon G, 1992. Food and health: the experts agree. Consumers' Association, London.

Cohen DR & Henderson JB, 1991. Health prevention and economics. Oxford Medical Publications, Oxford.

Coronary Prevention Group, 1990. Nutrition banding. HMSO, London.

Coronary Prevention Group, 1992. Just read the label. HMSO, London.

Department of Health, 1991. Dietary reference values for food energy and nutrients for the United Kingdom. Committee on Medical Aspects of Food Policy, HMSO, London.

Department of Health and Social Security, 1984. Diet and cardiovascular disease. Committee on Medical Aspects of Food Policy, HMSO, London.
FAO, 1977. Dietary fats and oils in human nutrition. A Joint FAO/WHO Report. Food and Agriculture Organization, Rome.
Gregory J, Foster K, Tyler H & Wiseman M, 1990. The dietary and nutritional survey of British adults. HMSO, London.
James WPT, 1988a. Healthy nutrition. WHO European Series 24. World Health Organization, Copenhagen.
James WPT, 1988b. Three Cantor Lectures on the implementation of a change of diet. 1. Dietary reform: an individual or a national response? R Soc Arts J 136: 373-387.
James P & Ralph A, 1990. What is a healthy diet? Med Int 82: 3364-3368.
James WPT, Ralph A & Sanchez-Castillo CP, 1987. The dominance of salt in manufactured food in the sodium intake of affluent societies. Lancet i: 426-429.
James WPT & Schofield EC, 1990. Human energy requirements. Oxford Medical Publications, Oxford.
Lang T, 1992. Food fit for the world? Public Health Alliance, Birmingham.
Leclercq C, Avalle V, Ramaldi L, Toti E & Ferro-Luzzi A, 1990. Simplifying the lithium-marker technique used to assess the dietary intake of discretionary sodium in population studies. Clin Sci 79: 227-231.
Nordic Council of Ministers, 1989. Nordic Nutrition Recommendations. Oslo.
Rose G, 1981. Strategy for prevention: lessons from cardiovascular disease. Brit Med J 282: 1847-1852.
Sanchez-Castillo CP, Seidell J & James WPT, 1987a. The potential use of lithium as a marker for the assessment of the sources of dietary salt: cooking studies and physiological experiments in man. Clin Sci 72: 81-86.
Sanchez-Castillo CP, Branch WJ & James WPT, 1987b. A test of the validity of the lithium marker technique for monitoring dietary sources of salt in man. Clin Sci 72: 87-94.
Sanchez-Castillo CP, Warrender S, Whitehead TP & James WPT, 1987c. An assessment of the sources of dietary salt in a British population. Clin Sci 72: 95-102.
Taylor R, 1984. The smoke ring: the politics of tobacco. Bodley Head, London.
WHO, 1982. Prevention of coronary heart disease. Report of a WHO Expert Committee. World Health Organization, Geneva.
WHO, 1990. Diet, nutrition and the prevention of chronic diseases. WHO Technical Report 797. World Health Organization, Geneva.

Abundance and variety: how to cope with European food supply

J. R. Lupien

Food Policy and Nutrition Division, Food and Agriculture Organization of the United Nations, Rome, Italy

Introduction

FAO works with member countries in the development and implementation of policies and programmes designed to efficiently develop agricultural resources and thereby strengthen national economies, improve food supplies, increase access to food, and raise the nutritional status of all population groups, both rural and urban.

Almost all countries are face with significant nutritional problems related to underconsumption and/or overconsumption of food although the extent of these problems varies from country to country, and within regions of individual countries.

FAO gives priority to work with the least developed and other low-income countries where problems of undernutrition are most prevalent. However FAO Programmes also give attention to food and nutrition problems of industrialized countries. In Europe the framework for FAO's activities in the region have been dramatically altered due to recent events and the 26th FAO Conference has called for more attention to be given to the new requirements of the economies in transition in central and eastern Europe.

Producing a sufficient quantity of food to meet the requirements of growing populations has been a problem for many countries of the world until the 1970s. In spite of a dramatic and continuing increase of the world's population, current food supplies now appear to be adequate to meet requirements, but adequate and consistent food supplies accessible to all remain a key issue, particularly in developing countries. Even when food supplies are adequate, poor distribution and lack of adequate purchasing power or access to food results in a many undernourished individuals.

Even in developed countries, for certain strata of society, including those on low incomes who are not provided with social welfare, refugees and other displaced persons and the destitute, hunger and undernutrition do still exist. However, for most people nutritional diseases related to overconsumption, improper diet and inappropriate life-styles are the major problem.

The challenge Europe is facing now is not how to produce more food but rather to ensure the consumption of the right quantities and quality of safe wholesome food to promote proper nutritional status and to prevent diet-related diseases. Action is needed to harmonize food and agricultural policies with national and individual nutritional

needs, not only to prevent the increasing incidence of diet-related diseases in many European countries but eventually to reverse the trend.

In Europe, overall food requirements have been satisfied through increased productivity, a high level of per caput income and a well developed and sophisticated food industry. However, as evidenced from public health data, diet- and life-style-related diseases are a significant cause of mortality among adults before the age of sixty in the European Region. Such diseases unnecessarily burden public health expenditure.

European food and agricultural policies can have wide-ranging repercussions on the health and nutritional status of many population groups within Europe and throughout the world. Surplus production within many 'food-rich' nations contribute to excessive or unhealthy intakes among domestic populations, creates unsustainable environmental pressures within Europe and also undermines agricultural development within food-poor countries.

In this paper policy issues and options on how to cope with the abundance and variety of European food supply are examined following a review of the available information on consumption (demand) and production (supply) and their resultant impact on nutrition and living conditions. The extent and mechanisms by which European food and agricultural policies affect nutritional well-being are explored and the implications for agriculture and the food industry are presented.

European food demand

The growth in European food demand (volume) is expected to decline progressively over the next decades due partly to demographic factors and decreasing physical activity levels and partly to the fact that high levels of consumption for most people have already been reached.

According to demographic projections, although there will be a small increase in population, the population growth rate will slow down and the median age of the population will increase. The elderly (aged 60 and over) are expected to comprise one fourth of the population in Europe by 2025 and as the proportion of the elderly increases, the demand for food will fall as aggregate physiological energy requirements decrease. The increased proportion of the elderly will lead to decreased physical activity of the population as a whole. This, together with shifts in occupational structure and the growth of labour-saving technology not compensated by leisure activities, will also have a slowing effect on the growth of food demand. With high levels of consumption having been reached there will be a natural slow-down in growth due to declining income elasticities of demand which account for up to half of the fall in demand for food.

In terms of expenditure, a small increase in demand for livestock products (in poorer countries), and for a diversity of high-value, high-quality convenience products (richer countries) are predicted. Expenditures on food are, therefore, expected to rise at a quicker pace than the volume of food demand partly because of the increasing cost of processing, packaging and retailing foods and partly as a result of increased

expenditure on take-away foods and foods consumed outside the home.

European food patterns have been changing throughout the past century in keeping with the technological and industrial revolutions which have remodelled the social, economic and demographic structure of the continent. Methods to process, preserve and market foods have been developed and progressively improved so that seasonal surpluses can be stored and made available throughout the year. In the second half of this century there has been a significant increase in consumption of animal products and fruits and vegetables, and a decline in the consumption of staple foods like cereals and potatoes. The tendency to change to diets rich in animal products is a common trait of affluent societies and is resulting in the convergence of national food patterns in Europe. The result is that differences in the structure of national diets have narrowed and differences between urban and rural food habits have decreased. These changes reflect above all the improvement in income and standard of living and the advancement in marketing and distribution, although differences in traditional food habits may still persist.

This convergence of national food patterns reflects to a large extent the tendency of Mediterranean countries and countries of eastern and central Europe to increase consumption of livestock products. In the latter countries the meat consumption level is already high, and the emphasis is now on improving the quality of meat for human consumption. In selected eastern European countries, increased consumption of animal products has been made possible in the past through import of coarse grains as animal feed. However, in those countries where consumer prices of foods have, until recently, been kept low and stable by the use of state subsidies, the removal of these subsidies has led to price hikes and a resultant sharp drop in demand for these products.

Pricing policies can effect shifts in consumer demand for food products but it is commonly observed that the shift is usually between different foods within food groups rather than between food groups. An example of this is the substitution in consumption of meats such as poultry and pork in western countries for more expensive red meats rather than a change to a meat-reduced diet.

Prices and incomes are decisive factors for food demand, particularly in Central and Eastern Europe where food consumption in the past has been encouraged at the expense of other goods and services by means of subsidies, and a large share of public expenditure was devoted to these. This was perhaps justifiable when food consumption levels were low but more recently consumption levels have been high and such subsidies have led to an increase in obesity and diet-related diseases, as well as a high wastage rate, partly as a result of poor food quality. Cuts in subsidies are having immediate effect on consumption, not only for food but also for other necessities of life. For those who are reliant on the marketplace for food, gains from the more efficient use of land and resources will take some time to be felt. There is concern for the adverse welfare effects these policies may have, particularly on food consumption and nutrition of low-income population groups and of those who do not have direct access to farm products.

Nutritional problems of Europe and associated dietary factors

In many countries with adequate availability and variety of food, diet-related non-communicable diseases associated with overnutrition and obesity, such as hypertension, heart disease, diabetes and various forms of cancer, have come into prominence as major factors contributing to increased morbidity and mortality, particularly in the 40–60-year age group.

In industrialized countries changes in dietary patterns over the past 70 years have been marked. Agricultural policies geared towards increased food production, as well as changing life-styles and growing affluence have led to diets which are higher in total fat, saturated fats and animal products, and lower in complex carbohydrates, vegetables and fruits.

There is ample evidence that diet can play a role in the prevention of cancer, especially bowel and stomach cancer. One of the world's largest in-depth prospective investigations into diet and cancer is to start in 1993 involving seven European countries and over 250 000 people.

From FAO food balance sheets, it appears that energy available for consumption in European countries is high and still increasing and that the structure of national diets continues to evolve. Based on these data the European Region has been divided into four sub-regions: Northern, Southern and Eastern Europe and the 15 republics of the former USSR (Tables 1 and 2).

The industrial countries of Northern Europe have an abundant and varied diet based on cereals (wheat), roots and tubers (potatoes), and animal products (meat, fish and milk products), which are principally produced locally. Processed and fresh local and imported fruit and vegetable are also important dietary components. On average, ca. 21% of energy is derived from cereals and 37% from animal products. With market integration well advanced and most foods being purchased, urban/rural differences in food patterns and behaviour are diminishing.

The form in which meals are taken is varied; lunch taken at home with the family is rare. Most people take their lunch at work or school, and weekends meals and snacks are also often taken outdoors (fast-food outlets, restaurants, etc.). With many household members consuming meals at subsidized canteens, and with dining out as an additional factor, food expenditure surveys present methodological difficulties in calculating household expenditures on food. For estimates of individual consumption, enquiries are very expensive and time-consuming. Consequently there is a need for new comparative methods of food consumption surveys on individuals to be developed and implemented. Such studies along with motivational research could lead to a better understanding as to why people change their food habits.

Countries of Northern Europe have high rates of cardiovascular disease and cancer, obesity and dental caries. Rates among the poor are higher than among the more affluent groups of society. For heart disease, rates are either declining slightly, for example in the Netherlands, Belgium and Iceland, or persist at high levels in Sweden, the UK and Ireland. Some countries are now beginning to show a decline in breast

cancer rates although direct links between diet and breast cancer are still tenuous.

The relatively high incidence of nutrition-related diseases in the countries of Northern Europe is associated with an increasing average age of the population, an

Table 1. Relative contribution (%) of selected food groups to total energy intake in European countries in 1989 according to FAO food balance sheet data.

Country	Animal products			Vegetable products				
	total	meat	dairy	total	cereals	roots & tubers	sugar	oils
Northern Europe								
Denmark	46.1	24.5	7.2	53.9	20.3	3.7	10.9	5.8
France	40.4	17.6	11.5	59.6	21.6	3.9	10.7	9.2
Finland	39.4	16.0	14.4	60.6	24.3	5.1	13.2	5.8
Iceland	38.7	12.6	15.2	61.3	30.2	2.5	14.8	6.7
Switzerland	38.6	18.1	12.1	61.4	20.2	2.4	14.1	9.0
Belgium/Luxembourg	38.5	12.1	8.5	61.5	15.3	5.0	11.1	14.4
Austria	37.8	13.1	11.4	62.5	18.5	3.2	11.4	11.8
Sweden	37.5	10.7	15.3	62.5	20.0	4.5	14.9	11.0
Former FRG	36.3	14.6	11.9	63.7	21.9	4.1	9.0	9.1
Ireland	36.0	18.1	11.1	64.0	22.6	6.4	13.6	11.2
Norway	35.0	10.9	13.0	65.0	27.9	5.0	11.7	9.6
United Kingdom	34.7	15.9	10.2	65.3	20.4	6.3	12.4	12.3
Netherlands	33.8	12.2	14.2	66.2	18.6	5.0	13.1	13.5
Average	*37.2*	*15.5*	*11.4*	*62.8*	*20.9*	*4.5*	*11.0*	*10.4*
Southern Europe								
Spain	31.7	19.8	7.2	68.3	21.8	5.5	9.0	14.4
Former Yugoslavia	28.5	10.9	8.2	71.5	36.4	5.3	13.6	7.5
Malta	27.1	11.4	8.7	72.9	31.6	1.7	16.9	11.1
Italy	25.6	11.4	7.6	74.4	32.5	2.1	7.5	17.3
Greece	24.4	12.2	8.7	75.6	28.6	3.6	9.3	17.7
Portugal	22.9	11.7	5.9	77.1	34.6	5.0	8.0	15.6
Average	*27.5*	*13.7*	*7.5*	*72.5*	*30.0*	*3.9*	*7.9*	*14.7*
Eastern Europe								
Hungary	36.6	13.1	7.9	63.4	28.9	2.7	11.4	6.4
Former GDR	35.3	15.0	6.9	64.6	24.6	7.6	11.7	6.2
Poland	33.9	12.0	11.0	66.1	33.2	5.5	14.2	5.6
Czechoslovakia	33.4	14.1	8.0	66.6	29.5	4.2	11.9	7.9
Bulgaria	25.1	10.8	7.4	74.9	39.6	1.5	9.9	10.1
Rumania	23.6	8.6	6.6	76.6	42.4	2.5	9.2	10.1
Average	*31.4*	*11.5*	*8.6*	*68.5*	*33.4*	*4.4*	*11.8*	*7.4*

Table 1 (continued).

Country	Animal products			Vegetable products				
	total	meat	dairy	total	cereals	roots & tubers	sugar	oils
Former USSR republics								
Northern Baltic countries								
Estonia	49.3	18.9	26.8	50.7	23.2	6.1	13.5	6.4
Latvia	43.7	17.9	22.5	56.3	27.6	6.9	13.4	7.2
Lithuania	42.2	17.2	21.8	57.8	28.8	8.6	13.1	5.9
Eastern countries								
Byelorussia	37.7	14.6	14.6	62.3	32.8	9.5	12.5	6.2
RSFSR	36.9	16.1	16.1	63.1	31.9	6.1	13.2	7.7
Ukraine	34.2	13.9	13.9	65.8	35.9	7.0	12.9	8.3
Moldavia	28.7	11.3	11.3	71.3	44.5	4.0	12.1	8.9
Northern Caspian countries								
Armenia	40.5	12.9	25.8	59.5	39.4	10.6	10.6	2.5
Azerbaidjan	29.3	9.0	18.5	70.7	52.3	12.1	12.1	8.9
Georgia	28.1	9.9	16.5	71.9	51.2	14.5	11.5	4.5
Countries south of the Caspian Sea								
Kazakhstan	34.0	15.7	16.0	66.0	39.8	4.7	11.3	8.7
Kirghizistan	29.9	12.4	15.8	70.1	44.1	4.6	11.2	8.3
Turkistan	23.4	10.2	12.0	76.6	53.5	1.5	10.8	8.0
Uzbekistan	21.7	7.9	12.3	78.3	55.7	1.7	8.6	10.4
Tadjikistan	18.5	7.4	9.7	81.5	57.0	2.3	9.4	10.9

population growth, and food consumption patterns which go with a higher proportion of both total and animal fat and salt, and a lower proportion of cereals, fruits and vegetables and fibre than the levels recommended by WHO. The long-term trend for the region as a whole indicates a decrease of the supply of total fat and animal fat and an increase of the supply of cereals, roots, fruits and vegetables. At the country level in Finland, Iceland, Ireland, Norway and the UK the contribution of vegetable products in the diet is increasing due mainly to an increase in consumption of fruits and vegetables. In Austria, Belgium, Denmark, Germany (ex FRG), Netherlands, Sweden and Switzerland the consumption of animal products is still increasing.

Studies on populations and individuals who have either traditionally had a lower fat intake or have reduced their fat intake have shown direct benefits in reduced levels of cardiovascular and related diseases. Avoidance of persistent overconsumption of all foods, with resulting obesity, is also an important factor in controlling diet-related problems.

Table 2. Contribution of selected food groups to total energy supply.

Food group	Northern Europe[1]	Southern Europe[2]	Eastern Europe[3]	Former USSR republics[4]
Cereals/roots				
1980	26.1	37.9	39.7	46.1
1985	25.3	36.1	38.5	
1989	25.3	33.9	37.8	43.7
Sugar				
1980	12.3	9.4	11.4	13.4
1985	12.0	8.6	11.0	
1989	11.0	7.9	11.8	13.1
Vegetable oil				
1980	10.0	13.3	6.3	6.7
1985	10.1	14.2	7.1	
1989	10.4	14.7	7.4	8.1
Vegetable products, total				
1980	62.4	75.8	68.7	68.0
1985	62.7	73.8	68.2	
1989	62.8	72.5	68.5	64.0
Animal products, total				
1980	37.6	24.2	31.3	32.0
1985	37.3	26.2	31.7	
1989	37.2	27.5	31.4	36.0

[1] Denmark, France, Finland, Iceland, Switzerland, Belgium/Luxembourg, Austria, Sweden, former FRG, Ireland, UK, Netherlands.
[2] Spain, former Yugoslavia, Malta, Italy, Greece, Portugal.
[3] Hungary, former GDR, Poland, Czechoslovakia, Bulagria, Rumania.
[4] Food consumption in recent years in the former USSR republics. Source: Douglas Diamond and Gregory Kinsunko, Center for International Research, US Bureau of Census.

Diet-related disease rates are lower in Southern Europe than in Northern Europe. The lower incidence of nutrition-related diseases in Southern European countries is thought to be associated with the nutritional qualities of the 'Mediterranean diet' which is lower in both total fats and saturated fats and higher in total cereals than the Northern European diet. The situation is, however, deteriorating in several countries increase in the percentage of elderly people, slowing down of birth rate and due to the adoption of a more Northern European pattern of diet, especially in urban areas. Consumption of cereals is decreasing and fat consumption is increasing which is accompanied by a rising trend in incidence of diet-related diseases in some Southern European countries. In Southern Europe, the percentage of energy derived from cereals is greater than in the North (30% against 21%) and the importance of animal fats is less. Consumption of vegetable products in that sub-region is the highest of all at 72% of total energy intake. Meals taken outside the family are also common and this habit is likely to expand with rising disposable incomes.

Eastern European countries traditionally consume large amounts of cereals (wheat especially) and potatoes. Food of vegetable origin is very important in the diet (accounting for 68% of total energy intake), while the consumption of animal products, essentially pork and milk products, is generally at a level between the northern and southern countries of Europe. Foods, especially those consumed in work canteens and staple foods such as cereals and potatoes, and sugar and oil have been heavily subsidized until recently. Fresh products like fruits and vegetables have not been widely available because of difficulties in distribution. The demand for sugar, oils, butter and margarine, meat and milk products is expected to increase further with a concomitant decline in consumption of carbohydrates and fibre due to decreases in consumption of cereals and potatoes. The demand for vegetables and fruits (especially the exotic types such as bananas, oranges, lemons) and other food products (coffee, chocolate, etc.) is also expected to increase.

Eastern Europe has seen a progressive and rapid increase in chronic diet-related diseases which have become a major public health concern. All countries have shown a substantial increase in premature death rates from cardiovascular diseases, except in countries where death rates were already high in 1970, for example in Czechoslovakia. Consumption of fat (total and animal fat) is increasing, that of cereals and roots is decreasing, whereas consumption of vegetables is almost static.

In Eastern Europe a number of nutritional problems may be observed ranging from undernutrition and nutrient deficiency diseases to overnutrition and related health problems. In Romania, for example, production and distribution practices have been largely to be blamed for inadequate food supplies reaching consumers, and frank undernutrition and hunger may be found. In Czechoslovakia the most common form of malnutrition is obesity, particularly among women, reflecting a food intakes in excess of 13.4 MJ/day.

In the former USSR republics it seems that trends in food consumption follow the classic pattern for human diets in that as disposable income increases there is a decrease in consumption of food products of vegetable origin (cereals, roots and tubers, and legumes, but an increase in fruits and vegetables) and an increase in consumption of animal products (meat and milk products), with an increase in both free lipids (vegetable oil) and bound lipids (animal fat, butter) and sugar.

On the basis of FAO food balance sheet information the 15 former USSR republics have been grouped as follows, although it should be noted that in each of these republics there are ethnic minorities, each with its own dietary habits and traditions:

- the northern Baltic countries (Estonia, Lithuania and Latvia) with a diet rich in animal products (meat and milk products), cereals (wheat) and potatoes,
- Eastern countries (Byelorussia, RSFSR, Ukraine, Moldavia) and the minorities in Russia with a higher consumption of cereals and potatoes and a lower consumption of animal products,
- the northern Caspian mountain republics of Georgia, Armenia and Azerbaidjan with a very high consumption of cereals and diets which are quite similar to those in eastern Turkey and northern Iran,
- countries south of the Caspian Sea (Turkistan, Tadjikistan, Kirghizistan, Uzbekistan, Kazakhstan). Here, with the exception of Kazakhstan, the importance of cereals is very high, reaching 82% in Tadjikistan.

In recent years there has been a considerable increase in the prevalence of diet-related non-communicable diseases in several developing and middle-income countries as well as in

Europe. The increasing incidence of chronic health problems, reflecting the combined demographic ageing of the population and general changes in dietary patterns together with changes in life-styles, is placing an additional burden on both households and health care systems. While commonly thought to be associated with affluence, increases of the incidence of these diseases are found in many low-income countries and among lower-income groups in high- and middle-income countries.

European food supply

Europe has seen decades of explosive growth in agricultural productivity, with the creation of unprecedented abundance and variety of food and agricultural produce. However over the past 25 years the growth rate of agricultural production for the region as a whole has slowed down with diminishing population growth.

The EC and other western European countries have demonstrated that surpluses of agricultural products can be achieved but at a cost that would be uncompetitive without the high prices maintained in these countries. The slowing of market growth, combined with the difficulties in reducing agricultural production, has resulted in overcapacity which remains a major problem in the agricultural sector. A slow-down in production is required but this will have social and economic costs which will require appropriate adjustment measures to minimize these effects on certain groups including farmers and low-income rural and urban groups.

In the countries of eastern and central Europe, production constraints have limited performance, but the growth rate of agricultural production in the ex-USSR over the period 1961–86 was similar to that of western Europe, and in eastern Europe as a whole the rate of growth surpassed that of the west, increasing production faster than domestic consumption. The ex-USSR failed to keep up with the rapid growth of domestic consumption because of the lack of investment in downstream activities such as transport, processing, storage and input industries and a low level of appropriate technologies. For these countries, agricultural policies will continue to emphasize growth but much of the anticipated increase in demand for foods could be met by reducing food losses without corresponding increases in farm output or imports. This can be achieved by improving, among other things, the quality of food supply and by increasing feed use efficiency following wider adoption of modern technologies and livestock management practices.

Food and agricultural policy issues which influence food supply

Agricultural policies are designed to affect the production, harvesting, storage, processing and marketing of agricultural commodities. Food policies include those agricultural policies that are specifically related to foodstuffs but also include a wide array of policies that affect people's access to and consumption of food.

Food and agricultural policy objectives are concerned with maintaining the level and stability of farm incomes and production, raising the efficiency of agricultural production, supporting agriculture-related industry, and increasing net agricultural

trade thereby generating/conserving foreign exchange. Achieving food self-reliance, providing adequate and safe food supplies, consumer price supports and broader social and environmental goals are often stated. However, the relationship between food and agricultural policies and nutritionally adequate diets has usually been neglected. Some of the various instruments of agricultural policies are production-guaranteed producer prices, target prices and deficiency payments, production/marketing quotas and input controls, storage or buffer-stock programmes, and subsidized inputs and services, and include investments in research and development, infrastructure such as transport, marketing facilities and more timely market information, trade, food processing, food quality and safety legislation, consumer protection and information, including advertising and nutrition labelling, and retailing policies.

Despite the diversity in conditions among countries which influence the food and agriculture sectors, some common issues which currently influence food and agricultural policy in European countries may be identified. These include the provision of a secure supply of food; ensuring that food is safe and of good quality; assuring access to adequate supplies of good and safe food or other basic necessities; and encouraging and educating consumers to develop better dietary habits. Economic efficiency in the use of resources and environmental considerations to tackle problems including pollution of water, loss of habitat for wild plants and animals, and food contamination are also important. While these issues are common to each country, there is a need for improvement of implementation of policies for such issues, with considerable changes in both policies, legislation and programmes to improve effectiveness.

Implementation of food and agricultural policies in Europe

Despite economic evidence which suggests that trade might be the least-cost way to ensure food security, most governments have preferred to implement policies which ensure a high degree of self-sufficiency. As prices on world markets are often below those paid to domestic farmers, this practice has led to the distortion of international trade as barriers to imports and subsidies on exports are required to avoid contraction of domestic production.

A recent FAO study on European agriculture, its policy issues and options to the year 2000 provides an up-to-date account of the central features of agricultural policy in both the east and the west of Europe.

In eastern Europe the growth rate of agricultural output has been as high as or higher than in the West, but focus has been on quantity of output rather than quality, and post-harvest losses are high. These high losses, around one quarter of total agricultural produce, combined with the possible overstatement of food supplies available for consumption as a result of poor statistical reporting procedures, may to some extent explain the apparent paradox between the excessive demand for food and the apparently high availability of food in terms of per caput energy supply as indicated by food balance sheet data. A number of diet-related problems have been observed which appear to be related to a lack of variety in the diet and to over-

consumption which may have been encouraged by artificially low prices.

The consequences of the transition in the eastern Europe/ex-USSR group of countries to a demand-led market for food and nutrition are now being witnessed. The restructuring and transition in these reforming countries are taking longer and are associated with stresses which are more pronounced than was hitherto anticipated. The food and agriculture sector has been particularly beset with problems. In many of the ex-USSR republics, and in Bulgaria and Romania, the distribution systems are extremely weak with obvious implications for production. Many countries are reducing state subsidies which results in lower production levels and consequently, unless imports are able to compensate for this reduction, in higher prices. In countries in transition, privatization of agricultural production will probably lead to increased economic efficiency. However, in such countries where the food and agriculture sector employs a substantial proportion of the total population, a protracted crisis in this sector is likely to be, at least in the short to medium term, at the expense of the well-being of large sections of the population, especially the poor and the unemployed.

Disincentives to agricultural production are also provided by tariff and non-tariff barriers to trade, including EC tariffs on selected agricultural products and export subsidies by developed countries which reduce eastern Europe's potential agricultural market share in third countries.

There is a need to better understand further the processes involved in this transition. For this purpose an FAO Task Force will study seven eastern and central European countries in cooperation with the UN Economic Commission for Europe. In addition, a regional project on agricultural restructuring to study existing agrarian structures and to exchange information on land ownership reforms in the region has been proposed, and Czechoslovakia, Hungary, Bulgaria and Poland have expressed their interest in participating. In Bulgaria and Albania, upon requests from the respective governments, FAO has undertaken food and agricultural reviews which are to be followed by the preparation of detailed plans of action.

In western Europe the Common Agricultural Policy (CAP) has played a major role in the political development of the EC and provided both a stable and a relatively high price level for major agricultural commodities. Under the CAP, producer subsidies, import levies and export subsidies have had the effect of keeping prices above world market prices thus sheltering farmers from market risks and encouraged the expansion of production. The result, however, has alsoe been the creation of surpluses produced at high cost to the Community's taxpayers leading to extra payments by consumers.

In some respects, demand factors have been responsible for successful agricultural performance, and new farming technologies have permitted increases in productivity as shown by the growth in agricultural output despite a strong reduction in the number of people employed in agriculture and in area of land farmed and falling real prices for farm products. Part of the increase has been due to the substitution of capital for labour and the proper application of research findings and improved management practices. The relative success of this approach is, however, put into perspective if the high support costs do not result in a net economic benefit to society at large when the costs of environmental impact and quality and safety concerns are taken into account.

Consumer price support programmes have been used to protect consumers from the high prices paid to agricultural producers to achieve the dual political objectives of providing cheap food for consumers and adequate incentives for producers through remunerative prices. However, since agricultural supports and consumer subsidies cost tax revenues, these funds can only be obtained by taxing other production sectors of the economy, thereby raising prices of other goods and services.

Subsidies have encouraged European farmers to overproduce with some cost to their domestic environment and with perhaps negative consequences for potential exports from developing countries. The excess European produce is sold on the international market thereby depressing prices which in turn reduces production by farmers in developing countries.

Europe has made some steps towards reducing the levels of support and protection to reduce surpluses. However, there are still policies and market imbalances in certain sectors, and efforts are required to wean countries away from subsidies that create food surpluses where they are not needed.

Environmental concerns

Concerns for the globe's physical parameters population, food, pollution, industrial production, energy and resource use are topics of contemporary focus and subjects of debate at the forthcoming United Nations Conference of Environment and Development (UNCED). FAO is actively promoting the Sustainable Agriculture and Rural Development (SARD) concepts developed by the FAO/Netherlands Conference on Agriculture and the Environment and ensuring that they receive adequate attention through the UNCED process. This approach will involve the gradual elaboration and implementation of an International Cooperative Programme Framework for SARD (ICPF/SARD). Important ecological thresholds, in certain localities, have already been exceeded and habitats and wildlife, sometimes life itself, have been endangered, for example, by chemical farm inputs, erosion, and radionuclide contamination.

Negative environmental effects can accrue from intensive forms of production, promoted by inappropriate pricing and support policies, often augmented by protectionist border control measures. Realigning these policies will promote development in those countries – many of them developing, but also countries in eastern Europe – where exploitation of the comparative advantages for certain crops can aid in the development of an efficient and environmentally sustainable agriculture.

Each sector has the responsibility to protect the environment and safeguard health and nutritional well-being. For the agricultural sector this will include protecting both the consumer's and the agricultural worker's health from harmful physical, chemical, or biological effects connected with the production, processing, distribution and consumption of foods. Creating sustainable agricultural and economic development will help to resolve such problems. The media play an important role in promoting awareness of environmental issues and should be provided with adequate and accurate information and encouraged to communicate this information effectively to the public.

Sustainable agricultural development and the conservation of the agricultural

resource base is linked closely to improved techniques of production, reduction of food losses, and protecting the safety, quality and wholesomeness of the food supply. FAO is concerned with and has competence in various aspects of environmentally sound and sustainable agricultural practices including post-harvest technologies and marketing processes, people's participation in land use planning (LUP) and soil conservation, improvement in water management, conservation and use of genetic resources, control and monitoring of food contamination, and in reducing the use of pesticides through Integrated Pest Management (IPM)[1].

Determinants of good nutritional status

FAO is concerned with the ability of people to secure an adequate supply of food to meet their nutritional needs. Food security is defined by FAO as comprising three components: *availability*, the existence of sufficient safe and hygienic food in the quantity and of a quality to ensure that all can enjoy a satisfactory diet; *stability*, which implies that food is available where and when it is needed; and *accessibility*, a situation in which all have the ability to acquire the food they need.

The provision of an adequate, stable and secure food supply is a basic requirement for the nutritional well-being of all individuals and populations. This implies that all people at all times should have both the physical and economic access to the basic food they need and that every household should have the opportunity of producing or procuring food in sufficient quantity and of sufficient quality for all its members to lead an active and healthy life.

In addition to a secure food supply, food must also be safe to eat and of good quality. This implies ensuring that the desirable characteristics of food are retained during its production, storage, handling, processing and packaging. Proper measures to guarantee food quality control help to reduce food losses and reduce exposure to food-borne disease. Further, assuring the quality and safety of foods stimulates trade while creating jobs, increasing incomes and ultimately improving nutritional well-being.

A healthy diet is essential for meeting the body's nutrient requirements and ensuring good nutrition. The nutrients needed by all individuals are most easily obtained by consuming a wide variety of foods of plant and animal origin and most dietary patterns are acceptable from a nutritional point of view as long as over-consumption is not a problem. What constitutes a healthy diet changes as people age and life-styles alter and the total quantity of food needed will decrease as growth ceases and physical activity declines.

As part of efforts to control diet-related problems, dietary recommendations have been issued by a number of countries which suggest ways in which changes in dietary habits can lead to improved nutritional status and reduce the risk of chronic disease.

[1] IPM is the appropriate mix of pest control strategies when yields, profits and safety of alternatives are considered and is judged the most successful pest control strategy in the context of sustainable agriculture.

Generally, diets that include a variety of foods, are balanced and moderate in intake are recommended. The following dietary guidelines reflect general consensus on dietary guidelines in developed countries:

- eat a variety of foods
- maintain healthy weight
- choose a diet low in fat, saturated fat and cholesterol
- choose a diet with plenty of vegetables, fruits, and grain products
- use sugars in moderation
- use salt and sodium in moderation
- if you drink alcoholic beverages, do so in moderation.

Countries differ in dietary patterns and nutritional problems and each country must tailor guidelines to its own circumstances. However, formulation and implementation of dietary guidelines can be an important step in promoting a healthy diet. Dietary guidelines can act as a desirable goal for individual consumers and the food industry to work towards and their existence and support permits a comparative reference for monitoring the situation. Dietary guidelines should be prepared such that they will accommodate desirable dietary habits among all population groups. They should also be flexible to allow choices among a wide variety of foods, including novel foods, and to adapt to changes in recommendations based on newly confirmed research findings. At the same time, governments must assure that the guidelines are based on sound scientific evidence and judgement to avoid confusing changes and advice to consumers based on scanty scientific evidence, folk beliefs, etc.

Although some countries have developed their own guidelines, Europe should consider developing nutritional guidelines for the region as a whole. Such guidelines have direct implications for the food and agricultural industry and for agricultural and food policies, and strategies to implement dietary recommendations have implications for several sectors in society including those concerned with education, environment, health and social security.

That dietary guidelines by themselves lead to healthier and better nourished populations is supported by evidence from those countries (the USA, Canada and some European countries, for example) where national dietary guidelines have been in existence for some time. It is essential that guidelines are put into practice and their implementation requires action from both Government agencies, health professionals, the food industry and mass media to convey the message of dietary recommendations in practical terms for the public.

Education is of great importance and the role of the mass media in informing people on how to adapt more healthy diets and life-styles is the key. Consumer education and nutrition labelling can create a demand in the marketplace for certain types of foods that as part of a balanced diet can meet these recommendations. This has implications for producers as well as food processors to respond to and meet these new demands. This dual responsibility is demonstrated by food manufacturers who have the power to shape consumer food choice but who are also responding to changing consumer food habits in, for example, the production of lean meats and 'light' foods and drinks.

Good nutrition is a necessity, but not the only condition for good health, as many other aspects of the way people live and work are also of importance. Nutritional considerations have therefore to be balanced with other life-style concerns. As urban populations grow, farm and industry processes become more efficient and reduce the need for human work, and sedentary life-styles and work conditions win ground, there is a need for considerable changes in the way people currently eat, and in the way physical exercise is viewed.

Given the wide range of social and economic factors that may cause nutritional problems, and the correspondingly wide range of possible actions and interventions that may lead to nutritional improvement, designing effective strategies to prevent and alleviate such problems requires the involvement of various sectors. Incorporating nutritional considerations into the policies of agriculture, education, health and environment sectors is a meaningful strategy for addressing nutritional problems.

Implications for agriculture and the food industry

The prevalence of nutrition-related diseases in Europe and elsewhere has evoked calls for the formulation and implementation of appropriate food and agricultural policies to reduce excess supply and intake of animal products and fat and to increase the supply of sources of complex carbohydrates and fibres such as cereals, roots, vegetables and fruits, the increased consumption of which is considered desirable. The food industry should be encouraged to produce, process and market foods suited to meeting overall nutritional guidelines and should cooperate with governments and other organizations to promote better dietary habits and healthier life-styles. The success of such efforts will ultimately be judged by reduction in diet-related diseases and improvement of the overall health and well-being of each individual.

For such policies to work, current scientific knowledge needs to be converted into practical measures to be implementated by various governmental departments and regulatory officials, food and agricultural industries, including agriculturalists, food processors and distributors in the private sector, academics, health care workers, educators and nutritionists, farmers, schools, consumers and other NGO groups in order to encourage each individual to prevent nutrition-related diseases, reversing the current trends in their development.

Supply side controls are widely practised and desirable, for example in controlling the use of food additives, pesticides, etc. However in economies where the production of foods is demand-driven, the use of supply side controls alone to change food habits is insufficient. Rather, nutrition education of the public and consumer orientation in nutritional matters need to be given greater emphasis. Both will play key roles in persuading people to consume a more balanced and nutritious diet, stimulating public awareness of the relationship between diet and nutrition-related diseases, generating demand for food which should in turn have an effect on the composition of the food supply, and encouraging changes in life-style towards more physical activity, cutting down or eliminating smoking and alcohol consumption, etc.

Encouraging better eating habits and positive health behaviour involves providing

consumers with appropriate information on how to make the best use of available resources to optimally meet nutritional needs from available foods as well as to increase awareness of the links between health, diet and exercise and health problems related to overconsumption.

In Europe, dietary change is primarily a matter for individual informed choice with nutrition education playing a key role. Structural factors beyond the immediate control of individuals, such as income distribution and food promotion, can also influence consumption. Policy issues concerning the promotion of nutritious diets and healthy life-styles, therefore, need to address both aspects and should include increasing the availability of nutritionally desirable foods to all population groups, maintaining adequate food safety and quality control programmes and consumer protection systems to improve the quality of foods, and raising awareness of industry and the public with respect to nutritional issues so that appropriate decisions can be made in food retailing, purchasing, handling and preparation.

Increasing the availability of nutritionally desirable foods

Governments, in recognizing the importance of making nutritional improvements an explicit objective of their agricultural, food and trade policies, need to take measures to improve the quality and safety of the food supply and encourage individual consumers, children, parents and the public as a whole to follow nutritional guidelines. The technological and economic consequences of these measures for Europe and elsewhere need to be considered as will their effect on the pattern of agricultural production, and assistance to farmers will be required to help their adaptat to new production techniques. The principal areas for possible action are reduction of fat consumption, increasing pruduction of vegetables and fruits, and biotechnology.

Reducing fat intake

Current estimates of total fat and saturated fat intake are well above recommended levels in most population groups in industrialized countries. Evidence shows that reducing saturated and total fat content in the diet is likely to reduce the risk of diet-related disease. Generally, dietary advice is to moderate the intake of fat in the total diet rather than to eliminate particular foods. For example, although meat and dairy products are dietary sources of saturated fat and their excessive consumption may be associated with higher serum cholesterol levels, they also contribute significantly to the intake of other essential nutrients and lend variety to the diet. Ensuring the availability of leaner meats and low-fat dairy products in the food supply will provide consumers with the opportunity to select these foods and thereby reduce overall fat intake.

Increasing vegetable and fruit production

A variety of methods may be us, such as more intensive cultivation, particularly under protected conditions enabling year-round supplies of local fresh produce. This offers the possibility of implementing integrated pest management, thereby contributing to

the production of vegetables with lower levels of pesticide residues. Improved availability can also be achieved through more liberal trade policies.

Horticulture research needs to be strengthened with the aim of identifying suitable crop production systems under protected cultivation. Variety improvement and breeding, including rapid clonal propagation technology, should be intensified to provide the growers with high-yielding planting materials with multiple pest resistance.

Biotechnology

Biotechnology refers to new technologies covering a wide range of techniques, including plant tissue culture, microbial and plant gene manipulation, production of monoclonal antibodies, protoplasm fusion and other methods of crossing distant species, embryo transfer and the in vitro synthesis of secondary metabolites and pharmaceuticals. These techniques include such procedures as genetic manipulation to obtain new crop and animal strains with desirable properties.

Biotechnology holds promise to produce novel foods from plants or animals not previously feasible for technical or economic reasons. For example, fat-free or low-fat substitutes for butter, cakes and ice-cream are now available, and fruits and vegetables can be genetically manipulated for longer shelf-life to allow better marketing. The market share of such foods in the near future is difficult to predict but as emphasis is likely to be on a diversity of good and safe foods, biotechnology, especially in high-value low-volume markets, will play an important role. Such foods will need to be examined in the context of the diet as a whole and with reference to nutritional guidelines.

Biotechnology can also increase the quantity and quality of nutritionally desirable nutrients in foods and can help provide a healthier diet. The application of biotechnology will create new products and new processes which will pose a challenge to consumer nutrition education. Dietary guidelines will therefore need to be flexible to accommodate these technical advances. The development of new foods by genetic engineering can also result in corresponding new problems for food safety and quality and this will require the development of new safety assessment strategies.

The introduction of new techniques based on biotechnology may favour the more sophisticated and capital-rich agricultures rather than traditional family farms, and such developments may lead to changes in farming systems and occupations. For those who are most adversely affected, some form of compensatory payments or income support may be required.

Improving the quality and safety of food

Poor food quality can cause serious nutrition and health problems to both rural and urban populations. Strengthening food quality and safety control and consumer protection services is essential to proper nutrition.

One of the objectives of food quality control is to promote a safe and honestly presented food supply to protect consumers from foods which are injurious to health

or unfit for human consumption and from adulterations and debasement of foods. Effective food quality control ensures that the desirable characteristics of foods, including nutrient quality, are retained throughout the stages of production, storage, handling, processing, packaging and preparation.

Health hazards which render foods unfit for consumption include biological and chemical contaminants, pesticide and veterinary drug residues, food additives and mycotoxins. Most food-borne diseases are caused by biological contaminants, mostly bacteria, viruses and parasites, which are responsible for increased levels of diarrhoea and other food-borne diseases and which can substantially enhance morbidity and mortality. The incidence of food-borne disease is rising throughout the developed world and greater vigilance is required to ensure that foods comply with regulations to protect health and consumer interests and guarantee fair trade.

Most European countries do not have coordinated food quality and safety policies throughout the food chain from production up to the point of consumption. Given the current levels of intra-regional trade, the uniform development and application of such policies are urgently needed.

Failure to follow appropriate production and processing practices in agricultural production and in food processing and preservation can increase the risk for contamination. Contamination associated with the misuse of pesticides, food additives and veterinary drug residues are some examples of problems that can affect the quality and safety of food. In addition, environmental contaminants (mycotoxins, heavy metals, radionuclides, industrial pollution, etc.) are becoming increasingly important problems with regard to food safety and food trade.

Data from the FAO/WHO/UNEP Food Contamination Monitoring Programme indicate that mean levels of contaminants in individual foods and in the total diet are generally well within established health criteria, guidelines or standards. Occasional problems have been reported and efforts continue to control contamination of food by limiting the use of pesticides and fertilizers in agriculture, or applying technological improvements such as the reduction of lead as solder in the canning process.

Basic safety standards must be based on sound science, practically enforceable and understood by the public. Despite good systems to monitor the registration and control of food additives, pesticide residues and other chemicals in foods, many consumers continue to show concern about chemicals in foods. Consequently there is a need for educating the public about the relative risks of these contaminants and the extensive government and food industry systems in place to control such potential problems.

Governments, the food industry and consumers each have their own responsibility for the provision of safe and nutritious foods. Responsibilities of the government include ensuring that a safe, nutritious and varied food supply is available to enable people to choose a healthy diet, providing safe and accurately labelled food products, and educating consumers about selecting a nutritious diet and adopting appropriate handling practices to prevent spoilage and contamination. This requires, in addition to food supply itself, appropriate food legislation, standards and an effective system of inspection and laboratory analyses to monitor compliance.

The agricultural sector and the food industry have the primary responsibility for

producing safe food. The adoption of good agricultural practices by primary producers at pre-and post-harvest levels, as well as the application of good manufacturing and food handling practices in food processing, distribution and service industries are important for maintaining the nutritional quality and safety of foods. Programmes such as Hazard Analysis Critical Control Points (HACCP) systems provide aa approach more focused on food quality and safety which, on the basis of experiences, identifies critical control points for enhanced monitoring.

Topics and areas for education messages include food handling practices as many of the problems of microbiological contamination can be eliminated or minimized by proper handling of foods in and outside the home. Food safety education is essential for retail and institutional food services. Education materials and instructions to the food industry on the requirements imposed by food laws and regulations and standards are also needed as is food safety information for the transport and storage industries in which, for example, inadequate handling and refrigeration can encourage food spoilage and microbial growth.

Consumer organizations can do much to discourage food adulteration and fraudulent practices and have a role in demanding food of the highest quality. Consumers should form effective organizations to participate in, and urge governments, legislation and industry to provide information and education on food safety and on rights and responsibilities relating to safe and nutritious food. Testing of products and publishing of their results, market surveys to select best buys, handling of consumer complaints and consumer pressures for adequate laws to ensure high standards are activities that lead to the supply of safer and more nutritious food.

Food standards

Food laws protect the health of consumers and prevent fraud. Standards and food regulations protect the nutritional quality of food supply by controlling the composition and description of foods passing into trades.

Food standards have been developed by subsidiary bodies of the Codex Alimentarius Commission as established by the Joint FAO/WHO Food Standards Programme. The purpose of Codex, among other things, is to recommend international standards and food 'codes' dealing with basic principles, technical specifications for products, and good manufacturing practices aimed at protecting the health of the consumer while ensuring fair trade practices. About 138 countries are members. Government regulators, scientists, technical experts and industry representatives serve Codex in both official and advisory capacities. Codex has developed more than 200 food commodity standards, more than 2000 recommendations for maximum residue limits for pesticides in various foods, and established more than 40 guidelines and codes for food production and processing. Many countries need to compare more actively existing national food regulations with Codex standards and codes to enable adoption of Codex work and harmonization of regulatory requirements between countries. In recent GATT Uruguay round discussions, it has been recognized that international standards often serve as reference points for multilateral and bilateral trade agreements.

Regulations and food laws affecting food composition vary widely from country to country. Many of these were originally devised to prevent adulteration and maintain the nutritional quality of food. However Europe is moving away from individual food composition standards in response to consumer demands for greater variety of foods. Some consumer organizations fear that removal of standards will reduce the quality of products and mislead the consumer, but others argue that foods may be of any composition provided that they meet general food safety and hygiene requirements and are properly labelled. Clear labelling is essential for informed choice and will require intensive consumer education to allow selection of a desirable diet.

Such measures will also need to be applied at other points in the food chain. It would include the controlled regulation of processed foods to inform consumers about the content of fat, salt and other nutrients in foods. Governments need to agree on adequate labelling rules to ensure the quality and nutritional desirability of foods.

New initiatives in nutrition labelling and education have the potential to improve nutrition by increasing public understanding of these connections and positively influencing public dietary patterns. Use of food labels as a nutrition education tool should be a fundamental part of national policies to improve food and nutrition.

Food losses

Policies related to food preservation and processing technologies and storage capabilities are also important for health and nutrition. FAO estimates global gross post-harvest losses of 10% of grain and grain legumes. Losses tend to be higher for starchy staples foods, perishables and fish, averaging around 20%. Losses may occur anywhere from the point where the food has been produced and harvested to the point of consumption. Causes of food losses may include biological (insects and pests) and microbiological damage (moulds, bacteria), chemical and biochemical losses (food enzymes), mechanical losses (bruising), physical losses (high temperatures), and physiological losses (sprouting and ageing). Other causes of food losses are inadequate drying, storage, transportation or marketing conditions. Reducing such losses improves food quality and availability and enables better access to food without increased production and concomitant use of agricultural resources.

Technologies that contribute to nutrition and health include food irradiation which is effective in reducing spoilage organisms and attenuating biological contaminants. Some of the public have expressed concern for the safety of this technique, but with open exchange of information the commercial applications of food irradiation should continue to make progress. In the meantime, governmental regulatory authorities and the food industry should actively assure that more traditional forms of food preservation are scrupulously applied to prevent food losses and retain the nutritive value of foods.

Food additives

Continued growth of the world population, food production and the need to assure adequate amounts of food accessible to all has required application of a wide range of technologies to foods. The considerable expansion of world markets for fresh and

processed foodstuffs and the development of the food industry has required the use of food additives in food to improve shelf-life, storage and presentation of foods to consumers. At the international level, FAO, jointly with WHO, have operated the Joint FAO/WHO Expert Committee (JECFA) for almost 40 years. JECFA evaluates the safety, proper use and technical specifications of food additives and veterinary drug residues in foods, as well as such contaminants as mycotoxins, industrial chemicals and heavy metals. With regard to food additives and veterinary drug residues, JECFA requires the submission and review by internationally known scientists of extensive chemical and toxicological safety data to assure that the use of these compounds in foods and food production present no risk to consumers. JECFA recommendations are widely used by national regulatory authorities and by the Codex Alimentarius Commission.

National responsibilities for regulating food additives are held primarily by health ministries or other national institutions concerned with the control and definition of specifications for food additives. At the international level the Codex Committee of Food Additives and Contaminants sets maximum permitted levels of additives in food based on the scientific advice of the Joint FAO/WHO Expert Committee on Food Additives. Several directives have been issued by the EC for regulating the use of food additives and the Commission is completing a list of additives which may be used in the Community, their maximum levels and the different foods in which they may be used. Products not covered by an EC directive continue to be governed in principle by the laws of each member state. The Codex Commodity Standards which contain provisions for food additives, have met limited acceptance by European countries. Changes to Codex procedures have been made to permit the acceptance of standards by regional economic groupings (EC, and others) in the interest of accelerating notifications of acceptance and eliminating non-tariff barriers. Several European countries have adopted national systems for estimating intakes of food additives. The Codex Alimentarius has completed the text of the guidelines for simple evaluation of food additive intake based on food consumption data for the guidance of all member countries.

Fortification of foods to raise the consumption of specific nutrients which are either not available or not consumed by certain groups or in certain areas in adequate amounts is widely practised. A common example is the fortification of salt with iodine or the addition of fluorine to water. In some countries wheat flour is enriched with thiamin and vitamins or minerals are added to certain other foods.

Improving public awareness with regard to nutrition

Policy issues concerning the promotion of healthful diets include enabling those on modest incomes to make the best use of available resources as well as increasing awareness of health problems related to overconsumption. One essential component of this is nutrition education and we need to explore ways in which consumers may be helped to take informed decisions about how to choose a healthier diet.

The diet of man is determined not only by economics but by a variety of social and

cultural factors connected with the way of life. A major factor in the selection of foods is the changes in life-style related to the fact that both parents are working outside the home, bringing changes in the time spent on shopping, preparing, cooking and consuming food. Greater nutritional awareness and the demand for more convenience are also determinants. However to a large extent food behaviour is rarely a matter of conscious thought, and this must be borne in mind when making efforts to change dietary patterns through education and information.

Consumer education is particularly important as consumer associations provide important information to their members and, by exerting pressure on government and industry, strongly influence both production and retailing of food products. Partly as a result of this, dietary habits are improving in some countries through efforts which are being made to provide consumers with necessary information to help them make the right choice of food.

The characterization of some foods as 'good' and other foods as 'bad', which occurs not unfrequently, is not scientific and causes undue consumer concern and confusion. The principal cause of diet-related diseases is obesity, which results from persistent intakes of more food than is necessary for growth, work and basic metabolic needs. A high intake of fat will increase energy intake, and high intakes of saturated fats and cholesterol can increase blood serum cholesterol levels but, in moderation, fats are useful and even essential nutrients as are proteins, vitamins and minerals. When individuals have access to adequate amounts of good quality and safe foods, the most effective way to assure correct eating habits, and avoidance of overeating, is good nutrition and life-style knowledge. In this way, consumers can be encouraged to eat adequate amounts of a varied diet to meet their needs, and to follow a healthier life-style as well.

In a market economy in which public demand is a major determinant for the production of foods, changes in food habits and dietary practices strongly depend on an informed public capable of making nutritionally correct choices. This will require the complementarity of nutrition education and media policies on a national level and the undertaking of extensive consumer education campaigns. In promoting healthy diets and life-styles, consumers have to select foods on the basis of the information available and their understanding of its significance. A certain level of understanding of nutritional needs and requirements is necessary, and people need to be advised about the implications of inadequate or excessive intakes and about how their nutritional needs may be optimally met from available foods. Priority should therefore be first given to education at all levels, but should start at the primary level. Special attention should be given to mass catering for children and youth and physical education programmes for reinforcing positive messages to influence future dietary habits. Integration of food and nutrition education in schools and medical colleges is an effective way of providing nutrition education. For successful teaching of nutrition it will be necessary to include nutrition education in teachers' training and to strengthen the nutritional content of medical courses.

With the percentage of foods consumed outside the home rising rapidly and the increase in community meals and food catering in institutions, nutrition education for

kitchen staff and catering managers increases in importance.Nutrition education for this group of people will contribute to a better choice of nutritionally desirable foods in meal preparation and improved preservation of the nutritional value of food during cooking, as well as the serving of meals in a clean and hygienic way.

Press and television play a major role in nutrition education by providing public information on various aspects of nutrition. Effective mass media campaigns must be devised and more resources directed to the organization of national nutrition and health education campaigns. Considering the influence of the mass media within and beyond national borders, coordinated policies, or at least a code of ethics for advertising of commercial products, would contribute significantly to the impact of such national campaigns. Their success will depend on governments taking the necessary measures to support such campaigns and their willingness to reach agreement with various agricultural, industrial and marketing groups.

The food label, advertisements and supporting literature are possible vehicles for communicating health messages to the consumer, but these must be well substantiated to avoid misleading and confusing the public. Consumers are often misled by food label claims or implied claims. FAO/WHO recently convened an Expert Consultation on nutrient values for food labelling which recommended that a uniform guideline for presentation of nutritional composition, taking into account consumer reaction and understanding for universal use be developed. It also recommended that an Expert Consultation be convened to develop nutritional labelling guidelines for dietary fat and that consideration be given by relevant Codex Committees to provide uniform guidelines on health claims and on claims relating to substances of dubious nutritional value.

Application of guidelines on nutritional labelling should be accompanied by campaigns for consumer education to improve understanding of the meaning and purpose of food labels. Experience has shown that when consumer and local community interests are involved in promoting initiatives in preventive measures, such as modifying dietary habits and life-styles to reduce non-communicable diseases, then a substantial proportion of the population learns to assimilate nutrition messages.

Conclusions and recommendations

In Europe, overall food requirements have been satisfied through increased productivity, a high per caput income and a well developed food industry. Despite this success, hunger and undernutrition still exist in some countries and particularly in population groups such as refugees and other displaced persons, the homeless and destitute, and those living in poverty. For these groups, specific nutrition interventions are needed to deal with this problem which may include food stamps, welfare meals etc. However, the major nutritional problems are related to overconsumption and improper diets with diet-related diseases being a significant cause of mortality and morbidity and of premature death of adults. Food habits appear to be a contributing factor posing an unnecessary burden on public health expenditure.

As part of efforts to improve nutritional status and reduce the risk of diet-related

diseases, dietary guidelines have been issued by a number of countries to encourage the consumption of the right quantity and quality of safe, wholesome food. These recommendations call for moderate and well balanced diets to include a variety of foods and make clear that there are no 'bad' foods, only bad diets.

To help put dietary guidelines into practice there is a need to formulate and implement appropriate policies to improve food and nutrition, maintain adequate food safety and quality control programmes and consumer protection systems to improve the quality of foods, and raise awareness of the public and industry to nutritional issues so that appropriate decisions can be made in food retailing, purchasing, handling and preparation. This has implications for several sectors including agriculture, education, health, social security and the environment, and the inclusion of nutrition considerations into their policies and plans would be a useful strategy for improving nutrition.

Dietary change is partly a result of structural factors beyond the immediate control of individuals, such as income distribution. Dietary change is also a matter for individual informed choice, and policies concerning the promotion of healthful diets also need to address this aspect. Foods should be selected on the basis of advice (based on objective scientific information) which will provide a more nutritious diet and a healthier life-style. To be able to make sense out of information available and make a reasoned judgement, a certain level of understanding is necessary of nutritional needs and requirements and how these may be optimally met on the basis of available foods. Consumer education is therefore of vital importance. Education together with information from sources such as the media, consumer groups, the food label, advertisements and supporting literature may then be used to make informed choices for an appropriate diet from a variety of safe, wholesome foods.

Actions need to be taken by central and local governments, the private sector, professionals, communities, and consumer groups at local, national and regional levels in stimulating public awareness of the relationship between diet and nutrition-related diseases, persuading people to follow more balanced and nutritious diets, and thereby generating demand for food, which should in turn have an effect on the composition of the food supply. These may include the following.

Governments

- Promote the implementation of national dietary guidelines and work towards the adoption of Europe-wide dietary guidelines.
- Harmonize national food safety standards and controls governing the production, harvesting, processing, preservation, distribution and marketing of food products.
- Establish a regional food contamination monitoring system to keep a close eye on food contaminant levels and their trends.
- Work towards further coordination among national food control agencies to harmonize food quality and safety policies.
- Encourage institutional feeding and food and nutrition programmes (e.g. schools, hospitals, prisons, armed services, soup kitchens, meals on wheels) to conform to the dietary recommendations.

- Ensure that government information is consistent with these recommendations and that policies and regulations are amended to increase the availability of nutritionally desirable diets.

Private sector
- Increase the availability of a wide variety of safe, wholesome foods that help consumers meet their dietary needs.
- Promote dietary recommendations and support consumer education to develop healthy diets, including labelling and cooperation in education curriculum and programme development.
- Establish and implement a code of ethics, either voluntary or statutary, for regulating food advertising practices.

Professionals
- Provide more effective nutrition education and more adequate training in nutrition of agricultural, health and education sectors and industry.
- Develop and introduce a nutrition curriculum for schools and colleges, in cooperation with the private sector.
- Maintain and update food composition tables.

Education of the public
- Ensure that consistent nutrition education messages reach the public; this will require a review of education materials, public information, advertising and supportive literature.
- Introduce nutrition principles into the educational curriculum.
- Initiate social marketing campaigns to disseminate dietary recommendations and sound advice on dietary issues to increase consumer knowledge and eliminate confusion.

Research

We do not know enough about changing food behaviour and there is a need for studies on when information motivates consumers to change dietary behaviour, and for new comparative methods of food consumption surveys on individuals to better assess this aspect. Therefore there is a need to :
- develop improved practical methods for identifying the forces influencing dietary habit formation to increase understanding of the causes of changes in dietary patterns; this will facilitate problem food areas and population groups to be targeted by improved nutrition education programmes;
- strengthen agricultural research in improving the agriculture sector's ability to improve nutrition and research strategies including establishing priorities for commodity research, production and farming systems research; new technologies should be based in part on nutritional considerations.

References

Alexandratos N, 1990, European Agriculture: Policy issues and options to 2000. FAO Belhaven Press.

Anonymous, 1987. Impact on world food security of agricultural policies in industrialized countries.12th Session of the Committee on World Food Security.

Anonymous, 1989. A selective review of food and nutrition policies outside Europe – A FAO Working Paper for the WHO Study Group on Diet Nutrition and Prevention of Non-Communicable Diseases.

Anonymous, 1990. Balanced diet: a way to good nutrition. 17th Regional Conference for Europe.

Anonymous. Protecting consumers through improved food quality and safety. Draft theme paper for the ICN.

DHHS, 1988. The Surgeon General's Report on nutrition and health. US Department of Health and Human Services. DHHS (PHS) Publication 88 50210. US Government Printing Office, Washington, DC.

DHHS, 1990. Nutrition and your health: dietary guidelines for Americans, 3rd ed. US Department of Agriculture/Department of Health and Human Services. US Government Printing Office, Washington, DC.

FAO, 1987. Impact on world food security of agricultural policies in industrialised countries. FAO CFS 87/3.

Marsh JS, 1991. Agricultural policies in Europe: how they interface with food and nutrition policies? FAO Nutrition Consultants' Reports Series No. 85.

WHO Study Group, 1990. Diet, nutrition and the prevention of chronic diseases. WHO Technical Report Series 797.

Annex 1. The state of food and agriculture in selected countries of eastern Europe

In Latvia during the years as part of the USSR, industrial and agricultural development was asymmetric, industrial production having increased 61 times and agricultural production only 1.8 times. Since 1939 1.1 million hectares of agricultural land were taken out of production and the amount of produce per person fell to nearly half that of the level currently achieved by the Nordic countries. Consumption of feed exceeds production and the present number of livestock and poultry requires imported concentrated feed. Latvia estimates that it requires 1.5–2 million tonnes of grains to be imported for local consumption. With the majority of former USSR republics currently facing low harvests of cereals and requiring grain imports themselves, Latvia will have to import this from outside the region. Latvia has abolished regulated prices for agricultural products and new legislation decrees that the state will not interfere with production. The Government is now making efforts to direct assistance to privately owned individual farms.

The Czech and Slovak Federative Republic is also undergoing massive liberalization. The bulk of both consumer and producer subsidies have been removed

which has dramatically lowered the demand for agricultural products. Industrial and agricultural production has fallen steeply, with increasing unemployment, falling real wages and rising prices lowering living standards. Agriculture has been characterized by high investment, energy, material and labour intensity with low productivity and negative ecological consequences clearly demonstrating the high costs of domestic production. The government sees the privatization of land as being the main issue in the agriculture sector and the change of property rights as the solution to difficulties in producing reasonably priced good-quality and competitive food products of international standard. However agro-industries also have a role to play in this and technical support in this area is needed.

Estonia has set free prices on agricultural products and restored family farms based on private property and begun to privatize state agricultural property.

Hungary has a relatively advanced agricultural and food sector which has been able to fully supply food to its consumers while at the same time contributing to the national export performance. Discontinuation of subsidies has resulted in price hikes and a sharp drop in purchasing power. Reduction in domestic purchasing power reduced agricultural GDP but there has been an increase in exports to western markets. Currently Hungary is exporting one third of its agricultural output to western countries. With the collapse of the markets in former COMECON countries, strengthening of international competitiveness of agricultural and food products is necessary and FAO is providing assistance in the streamlining of food quality control services. Assistance for technological improvements in processing, freezing and packaging etc. is also required. Hungary is transforming land ownership and encouraging privatization in such a way that the advantages of existing large-scale farms are not lost. Family farms of various ownership and management types are being created while the productive potential of large state farms and voluntary cooperatives are safeguarded. Emphasis is being placed on environmental issues with a switch from quantitative to qualitative criteria for agricultural plans, and the introduction of new marketing practices to increase the competitiveness of products and so resist protectionist pressures.

Several central and eastern European countries including Czechoslovakia, Bulgaria, Hungary and Poland have demonstrated their interest in improving and strengthening their national food control systems, reflecting both their desire to improve the quality of their national food supplies and their interest in potential markets in the EC and elsewhere. FAO assistance has also been requested in the areas of food and nutrition policy and in food laws, regulations and legislation with a view to harmonization with EC requirements.

Such measures will also need to be applied at other points in the food chain. They would include the controlled regulation of processed foods to inform consumers to prevent excess intake of fat, sugar and salt via such products as processed snacks and convenience foods. Governments need to agree on adequate food standards and labelling rules to ensure the quality and nutritional desirability of such foods.

Rich and poor countries compete in the marketplace as unequal partners with free

and open trade generally being to the disadvantage of the weakest. Where developing countries have a comparative advantage and a competitive edge – often for the export of primary commodities – the rules are often changed and tariff barriers to imports on such commodities are imposed to prevent free and open competition.

At the policy level the costs and implications of the implementation of the nutritional guidelines should be a focus of study.

Better nutritional status has a cost. Governments will need to decide who will pay for it and how this should be done. For obtaining authoritative and scientific information for making such decisions they will need to establish and support national food protection agencies on which policy makers can fall back for adapting existing agricultural, trade and food policies.

Consumer groups in northern and western Europe have a stronger influence on food supply than those in other areas, but this is likely to change.

What are the likely effects of the adoption of guidelines on the demand for particular foods and therefore on agriculture? What is required at the level of production, processing and distribution to ensure that the desired products are on the market, are of good quality and safe, and are available to all?

The EC directives will cause a change in how foods are produced and distributed, especially processed foods. The siting of industry, no longer constrained by national boundaries, will be determined largely by the location and efficiency of the transport system to get their products to the European consumer. Economies of scale will play a greater role as fewer food processing facilities will be needed. What impact will nutrition guidelines and policies for improving diets have on this trend for the concentration and integration of organizations within the food system?.

All these aspects will apply in varying degrees to each European country. Many of these policy areas involve a number of ministries, such as Finance, Agriculture, Education, Health, and Social Affairs. Therefore a case may be made for a coordinating body, ministry or inter-ministerial council to oversee implementation of a national nutrition policy.

In the UK, for example, government figures show that 10% of the population were obese in 1987 compared with 7% seven years earlier despite all the media attention to fatty foods, healthy diets and exercise and in spite of the fact that people on average were eating less. The market now provides a range of products that is beyond the imagination of consumers who knew only the corner shop.

Post-harvest wastage of food represents a less obvious but equally serious problem. In the livestock sector the use of new techniques for removing all the meat from the bones and combining with proteins from otherwise inedible offal to produce meat-like fibres containing little or no fat is one example of full utilization of production.

Man the omnivore and the social construction of food

C. Fischler

CNRS National Centre for Scientific Research, Paris, France

Introduction

Devising and implementing nutritional policies is, to say the least, a challenging, arduous and somewhat perilous task. As has often been pointed out, human beings do not simply eat their food; they also exert their thinking abilities upon it, turning it into a cognitive and cultural construct. Each culture, each social group, to a certain extent each family and even each individual, has a set of very specific and distinctive features in the way they conceive of, and relate to, their food. Such features are part and parcel of the local and individual sense of identity and tie into the actual stratification and organization of society. It is not always easy to obtain those changes in eating patterns that are deemed desirable by nutritional intervention programmes, if only because such changes would imply modifications of a much more radical nature than could appear at first sight, including in the actual fabric of society. Not only is trying to change food habits a difficult task, it is also a potentially dangerous one. Mere failure to achieve the desired result is not the only risk: boomerang effects are a possibility. For instance, one can look at the current obsessive and erratic dieting in Western affluent societies, particularly among women, as such a counterproductive by-product. Moreover, we should always be reminded that those people in charge of devising and implementing nutritional policies, including the scientific community, supposedly belong to the same species, *Homo sapiens*. As human omnivores, it is highly unlikely that we can be totally immune to the effects of cultural and social biases. There even is some evidence to indicate that we might be just as prone as everyone else to infuse nutritional issues with judgements of values, morality and, generally speaking, much more than plain nutrition.

This paper outlines some basic, universal characteristics that result, at least in part, from the omnivorous nature of *Homo sapiens*. Understanding the consequences of these traits sheds light on the function of culinary cultures (cuisines), as well as their high variability and limited flexibility. In modern, affluent societies a maladjustment occurs, for some of the needs arising from the basic traits are no longer fulfilled. Both the assessment of risk associated with dietary practices and the measures and recommendations aimed at reducing this risk raise issues that are difficult to solve.

The following characteristics of the relationships between man and food seem to be universal.

Classification

The human mind operates as if it had to classify everything. As Tylor, an early British anthropologist, put it, it tends 'to classify out the universe'. Nowhere is this feature more clear than in the realm of food. All cultures, from the most 'primitive' to the most complex, categorize foods. The mere definition of which item is edible and which is not is subject to remarkable variability. Insects can be a very good source of protein, and some are considered delicacies in certain African, Asian and Latin American cultures. In contrast, insects are perceived as simply not edible and particularly repulsive by most Western populations. There is no immediate, clear nutritional or organoleptic rationale to explain these differences.

A food may be appropriate to eat at only one time (e.g. breakfast but not dinner; during a festival but not on an ordinary day), may be eaten by some people but not others (foods for adults, children, the elderly, the sick, etc.), may be eaten only in association with another food but may be imcompatible with a third. We categorize foods and relate them one with another or with particular consumers or circumstances. This implies the existence of complex rules regulating the links between different foods, their ingredients, their preparation, their consumption, and the behaviour of the eater. These classes, rules and norms are the basis of food cultures or cuisines. Most of the time we are unaware of these rules, even though we may apply them daily in our eating. We can bring these rules to awareness when we try to ignore them or come into contact with another culture with different norms. Eating croissants for dinner or spaghetti for breakfast, even soup for lunch, would make most Frenchmen uneasy. Cuisines have often been compared with language. All human beings speak, but they speak different languages; they all eat, but they eat different cuisines.

The principle of incorporation

A second universal characteristic of our relationship with food may be described as the principle of incorporation. Incorporation is, quite literally, the act of taking a food into the body. Throughout the world, consciously or unconsciously, people believe that they take on some characteristics of the food they eat. This is illustrated by the saying 'Man ist was man isst' (You are what you eat) (Rozin & Fallon, 1987). In certain populations, warriors avoid eating hare, for fear they will run away; pregnant women avoid pork for fear of giving birth to an ugly child (Frazer, 1911). This way of thinking is far from being limited to 'primitive' societies: contemporary ones will equally consider that foods can somehow 'contaminate' (positively or negatively) the eater. Until recently, for instance, in France as well as in many Western industrialized countries, red meat was thought to provide strength and vigour.

The omnivore's paradox

A third fundamental characteristic of our relationship with food can be described as 'the omnivore's paradox' (Rozin, 1976). Man is an omnivore. Omnivores are unable to obtain all the nutrients needed from a single food source, and have to eat at least a minimum variety of foods. On one hand, needing variety, the omnivore must be 'neophilic', i.e. prefer diversity, innovation, exploration and change. But on the other hand, the omnivore has to be conservative, suspicious towards new foods, because any unknown 'food' is a potential poison, a danger. Because of this 'double bind' a form of anxiety appears to be literally built in the condition of being an omnivore.

Moralizing and food

In all cultures, morality and food are strongly associated. In archaic societies, religion, medicine and food are tightly interwoven. All religions without any exception include dietary rules, prescriptions and prohibitions. Early medicine is to a large extent dietetic. Hippocrates stated that 'Thy food shall be thy medicine'. The basis for this is the principle of incorporation (You are what you eat), which implies that controlling one's food, one can control one's body and soul. Thus both from the medical and religious points of view, food control is central and crucial. Food, in particular the sharing of it, is no less crucial in social organization. In early social forms, hunting involves cooperation and consuming preys implies sharing and redistribution. Hunter-gatherer societies all have complex sets of rules which tend to maximize distribution of resources obtained from hunting. In ancient Greece, meat could only be consumed if the cattle had been ritually slaughtered in a sacrificial ceremony. The sacrifice was seen as a ceremony in which the food was shared between man and the gods (the bones, some fat and the skin of the animal were burned and the smoke carried the gods' share to their heavenly residence). It was followed by a banquet in which the meat was shared among citizens in accordance to their rank and status in the Polis (Detienne & Vernant, 1979). Across history and space, infringing the rules of food sharing has been blamed and condemned. Gluttony, i.e. eating more than one's share, is just one of the aspects of such reprobation. Refusing to eat one's share is almost as offensive, as is shown by the protest value of fasting in hunger strike. Just like sex, food is particularly subject to moral judgements and ideological bias, as is evidenced by a long string of both medical theories and popular beliefs on the relationship between health and food, in which guilty food habits were seen as the cause of punishment through various forms of plagues. To mention just one example, in the 17th century, renowned British physicians reasoned that the high incidence of certain diseases in Britain had to be associated with increased consumption of sugar. Sugar was termed evil and several authors decided that excessive 'indulgence' in it was responsible for various diseases (a form of tuberculosis, the great plague of London, and even, according to Thomas Willis, scurvy) (Fischler, 1987, 1990). We would all like to be certain that such contamination of nutrition by moralization is totally absent

from contemporary science. Yet such topics as sugar, meat, fibre, fat and, to a certain extent, cholesterol should probably be subjected to some scrutiny from that angle.

The function of cuisines

The functions of cuisines can be analysed in terms of the three basic characteristics outlined above. First, cuisines provide a series of rules which, as it were, help to keep the world in order, if only in the eater's mind. Second, they help define who we are by way of controlling incorporation. And third, cuisines help resolve the omnivore's paradox: Novelty, the unknown, can be steeped in the sauce of tradition; originality is tempered by familiarity and monotony relieved by variety (Rozin, 1976). Moreover, the complex sets of rules involved in any given cuisine (preparation, table manners, appropriateness of foods for people, occasions, time, weather, etc.) provide a structure for individual and collective behaviour, a framework for everyday life. Symbolically, the culinary act sanctions the passage of food from Nature to Culture. It thereby helps to resolve the omnivore's paradox or to make it manageable and to regulate the anxiety of incorporation.

Today: nutritional cacophony and the human omnivore

Socio-economic change in modern Western societies has entailed considerable modifications in our relationship to our food. The socio-cultural context of culinary systems (cuisines in the sense outlined above) which traditionally determined what should be eaten, by whom, and when, has rapidly changed. Social norms are eroding or loosening.

In all developed countries, market research shows the existence of a trend towards apparently unstructured food intake. In France, for instance, in a growing part of the population, the structure of the traditional food pattern tends to become less constraining (length of meals, number of dishes, snacking, skipping courses or meals, etc.; for a review, see Fischler, 1990). Because of the erosion of traditional culinary patterns, to a large extent, the resolution of the omnivore's paradox is no longer performed. The eater must make daily decisions about the selection of his/her food, and those decisions can no longer be based on widely recognized, implicit, rules of selection. Moreover, there is an increasing number of – often dissonant – sources that offer prescriptions, information, directions for food selection and eating behaviour. Clues from processors, drug producers, consumer organizations, various medical disciplines, all compete for the consumer's attention and compliance, creating a nutritional cacophony. To a large extent, modern distrust over the safety of food and concern about the appropriateness of diets stem from the anxiety associated with the deafening nutritional cacophony. The dramatic increase in consumption of cookery books and diet books in the bookshops, of recipes and diets in the media, may be an expression of a growing demand for rules and directions for food selection. Surveys and polls in Western countries show that, at any one time, between one fifth (France,

Italy) and one third (USA) of the population are following some form of diet (Fischler, 1990).

Nutritional policies and the dietary cacophony

Health policies, nutritional education and dietary guidelines have been developed in response to what is perceived as serious health problems brought about by the evolution of food habits in modern society (the 'diseases of civilization' as they are sometimes called). However, they can also be considered to be a form of social response to the anxiety about food selection described above. If this is true, a major aim of public health policies should be to reduce people's anxiety about the food they eat, rather than to fuel it. Erratic dieting might be just as much of a threat to public health as erratic nutrition. As we have seen, man is influenced, consciously or unconsciously, by moral judgements and social attitudes, particularly when it comes to food. Medical and scientific experts, including all of us taking part in this Conference, have no a priori protection against such biases other than applying the rules of science. We are not isolated from society. We are not immunized against conflicts of interest, nor are all of us totally without stakes in the economical, social and political power games of society. We are not immunized against the beliefs, ideologies, values or fashions of that society. Extreme vigilance and self-criticsm are a must.

References

Detienne M & Vernant JP, 1979. La cuisine du sacrifice en pays grec. Gallimard, Paris.

Fischler C, 1987. Attitudes towards sugar and sweetness in historical and social perspective. In: Dobbing J (ed.), Sweetness, pp. 83-98. Springer-Verlag, Berlin.

Fischler C, 1990. L'Homnivore. Odile Jacob, Paris.

Frazer JG, 1911. The Golden Bough. London.

Rozin P, 1976. The selection of foods by rats, humans, and other animals. In: Rosenblatt JS, Hinde RA, Shaw E & Beer S (eds.), Advances in the study of behaviour, pp. Academic Press, New York.

Rozin P & Fallon AE, 1987. A perspective on disgust. Psychol Rev 94 (1): 23-41.

Food, life-styles and energy

G.K. Heilig

International Institute for Applied Systems Analysis, Population Program, Laxenburg, Austria

Introduction

Energy and food are linked in the most basic way. Life on earth utterly depends on the solar energy which is captured by plants and transformed into biomass. The unique capacity of plants to fix solar radiation and store it in the form of chemical energy is the first link in a long chain of transformations which in the end provides vital elements, minerals, vitamins, fats and proteins to animals and man. During the first 500,000 years our human-like ancestors, as gatherers and hunters, totally depended on the plant transformation of solar energy. As long as mankind lived in small family systems and scattered tribal units the energy balance of nutrition was probably not bad. It was estimated that a 'primitive' food gatherer who is collecting nuts within an average distance of 4.8 km from his home, invests some 11 MJ in this effort – for walking, collecting the nuts, for the normal metabolism during leisure time, and other 'non-working' activities. Since a typical return of this effort would be some 44 MJ in food energy, his energy balance would be quite positive (based on calculations from Lee, 1969; Pimentel, 1984, p. 3).

When *Homo sapiens* decided to camp in caves during the Older Paleolithicum some 60,000 years ago, he began to use fire for cooking food, for lighting and heating the cave, and as a means to drive away wild animals. Since the emergence of stable settlements in the early Neolithicum (some 8000 to 5000 years B.C.) fire was gradually used to clear land for agriculture, fertilize the soil (even if the Neolithic farmers might not have been aware of it), cook the food, and – probably – conserve meat and fish by smoking and drying. In the millenniums that followed the farmers slowly learned how to utilize energy sources other than the sun and the fire: they began to harness draught animals, use wind and water to power irrigation or to process harvests. Since 4100 B.C., agricultural societies thinly populated the alluvial lowlands between the Tigris and Euphrates rivers in the flood plains along the large Asian rivers (Whitmore et al., 1990). Here a first agricultural revolution set the ground for the development of human societies and states. Yet the average agricultural productivity – and thus food energy return – was quite low as compared to our present standards. During the next several thousand years agricultural technology stagnated. In the 12th century European farmers still used ploughs of a design similar to a prototype developed in Babylon 3000 years B.C. (Grigg, 1981).

Between 1690 and 1700 in England, between 1750 and 1760 in France and between

1790 and 1800 in Germany – some 30 to 50 years before the Industrial Revolution – the second ('modern') agricultural revolution in Europe set the ground for a new balance between people and land. Only since then farmers have used machinery fueled by fossil energy to plough the soil, power irrigation pumps, harvest and process the crops. The use of machines was a critical factor contributing to a lift of agricultural productivity to a much higher level. Through tractors, pumps, reapers, threshing machines, harvesters, lorries it became possible to cultivate large, previously unusable areas and – even more important – to supply distant markets (Binswanger, 1984). These technical devices, however, utilize only a most basic process of energy conversion to increase agricultural productivity: the transformation of fossil energy into mechanical power. The real breakthrough only came when biochemists learned how to optimize the growth of plants with the help of fossil energy, transformed into chemical energy in artificial fertilizers (Fussel, 1967).

Today, the supply of food, which once was a simple process of collecting and hunting, has evolved into a complex network of production activities, industrial processes, market and price mechanisms, trade arrangements, food policies and distribution channels. On each stage of this widely expanded food chain the consumption of fossil energy plays a significant role. This paper will identify some of the energy-related links in our food chains and show that social and cultural factors (such as life-styles) heavily influence the overall energy efficiency of the food system.

For a systematic analysis of linkages between food, energy and life-styles it seems appropriate to distinguish four levels or domains:
- physical processes;
- (agricultural) technology;
- organizational arrangements, infrastructure, and logistics in food processing;
- social and cultural conditions.

Biophysical processes

The first energy-related link in a food chain is the conversion of solar energy into biomass. By means of photosynthesis green plants can transform solar radiation into chemical energy which they use for growth and sustenance. However, only a very small proportion of the solar radiation hitting the ground can be utilized in food plants. Four major factors are involved in the reduction of usable energy: (1) some 75% of the sun's radiation spectrum is unsuitable for photosynthetic transformation: the wavelength is either too long or too short; (2) another 10% of the useful radiation energy is not absorbed by the plants, but reflected from their surface; (3) the growing season is much shorter (usually only 4 to 5 months) than the sunshine period; (4) 20% to 40% of the solar energy that is transformed by photosynthesis, cannot be used for biomass growth but is consumed for respiration (estimates taken from Schmidt, 1986). In addition to these general restrictions the energy efficiency of photosynthesis also varies by a wide margin among different kinds of plants.

Table 1. Conversion efficiency of selected crops and natural vegetation, in 10^{12} J per ha per year (and in % relative to solar energy).

Solar energy	*59*	*(100.0)*
Maize	0.29	(0.5)
Potatoes	0.21	(0.4)
Wheat	0.12	(0.2)
Natural vegetation (oceanic/terrestrial)		(0.1)

Source: Pimentel (1984).

Efficiency of photosynthesis

We can find good and bad solar energy converters. Maize is one of the most productive food and feed crops; it has yields of about 7000 kg/ha of grain and 7000 kg/ha of biomass as stover. Converted to heat energy this equals 290 GJ which is equivalent to 1% of the solar energy reaching a hectare during the growing season (and 0.5% of the solar energy input per year). Potatoes, on the other hand, have a lower energy efficiency.[1] Their solar energy conversion ratio is only 0.4%.[2] Wheat production is even more energy-inefficient: just 0.2% of the sunlight reaching the ground over a year is turned into biomass (see Table 1). In general, however, the conversion efficiency of food and feed crops is much higher than that of the natural vegetation, which in the USA is estimated to be only about 0.1%.

Since few humans are pure vegetarians, overall energy consumption in food systems not only depends on the level of efficiency at which plants can convert solar energy, but also on energy losses in livestock production.

Efficiency of meat production

Meat production is based on a double energy transformation. First, solar energy and nutrients in the soil are converted into biomass by green plants. When the plants are fed to animals the proteins, fats, carbohydrates, etc. in the fodder are transformed again into energy which fuels the growth and sustenance of the animal. However, only a small proportion of the energy consumed is used by the animal to build up fat and muscles, or to produce milk or eggs. A major proportion of energy intake is spent on keeping up normal metabolism (stabilizing body temperature, keeping up blood

[1] Energy efficiency, however, is not the only factor determining the productivity of a food crop. While the solar conversion ratio of potatoes is relatively low, their overall productivity in moderate climate is rather high. The introduction of potatoes was a major factor which ended the times of famine in Central Europe.

[2] There is, however, some disagreement on the numbers among experts. Schmidt has published a higher estimate for the energy efficiency of potato production in Austria (Schmidt, 1986).

circulation and breathing, etc.) and – simply – for moving around on the meadow.

The double energy conversion in livestock production is a biophysical process that inevitably brings about a relatively low energy efficiency in meat production. For Austria it has been calculated that of every 100 J used to produce vegetable food 83 J is returned in the form of food energy, whereas of every 100 J spent on livestock production only 6 J is returned in the form of meat. For the same energy content in food one has to invest 14 times more energy in livestock than in food crop production systems.

Photosynthesis is the starting point of all food chains. Already at this basic biophysical level the choice of a specific food or feed crop with optimum solar energy fixation could (slightly) improve the overall energy efficiency of food supply. More important, however, is the ratio between animal and vegetable food in our diet, due to the inherent energetic inefficiency in meat production. But the most important factors that determine a food chain's overall energetic efficiency are linked to 'higher' levels in the system's hierarchy: to agricultural technology, to the logistics of food distribution, and to the patterns of food consumption. Let us look at some of these factors in detail.

Agricultural technology

Probably the most fundamental difficulty of agriculture ever since its invention by Neolithic farmers is the inevitable exhaustion of the soil. After a few growing seasons yields usually begin to decline, and gradually the output falls below the input of seeds. This is a 'basic law' of agriculture and should not be confused with modern problems of soil degradation or over-utilization. The cause of the phenomenon is simple: plants not only use renewable substances from the soil (such as water) to build up their cells, but also extract minerals and other non-renewable chemicals. With each harvest a significant amount of these elements, incorporated in the plants, is permanently removed from the field. As Pimentel (1984, p. 10) puts it, 'When 7000 kg of maize is harvested an estimated 40 kg of nitrogen, 5 kg of phosphorus, and 6 kg of potassium are removed from each hectare of land'. In advanced production systems with high-yield food plants the nitrogen loss can be up to 100 kg per hectare.

There is no way to stop this gradual depletion of vital plant nutrients other than to recycle it to the soil. In a few agricultural areas this is done by natural phenomena, such as volcano eruptions (ashes and lava from volcano eruptions are rich in minerals and other elements essential to plant growth) or floods which bring fertile mud to the fields.[3] Normally, however, the farmers need special techniques of refertilization

[3] This is why agriculture emerged in the flood plains and deltas of large rivers, such as Tigris, Nile or Ganges. For more than 3000 years Egypt's agriculture was based on the river Nile's floods which brought fertile mud to the fields. Today Egyptian farmers have to use enormous amounts of artificial fertilizers to compensate for lacking floods and to further increase yields.

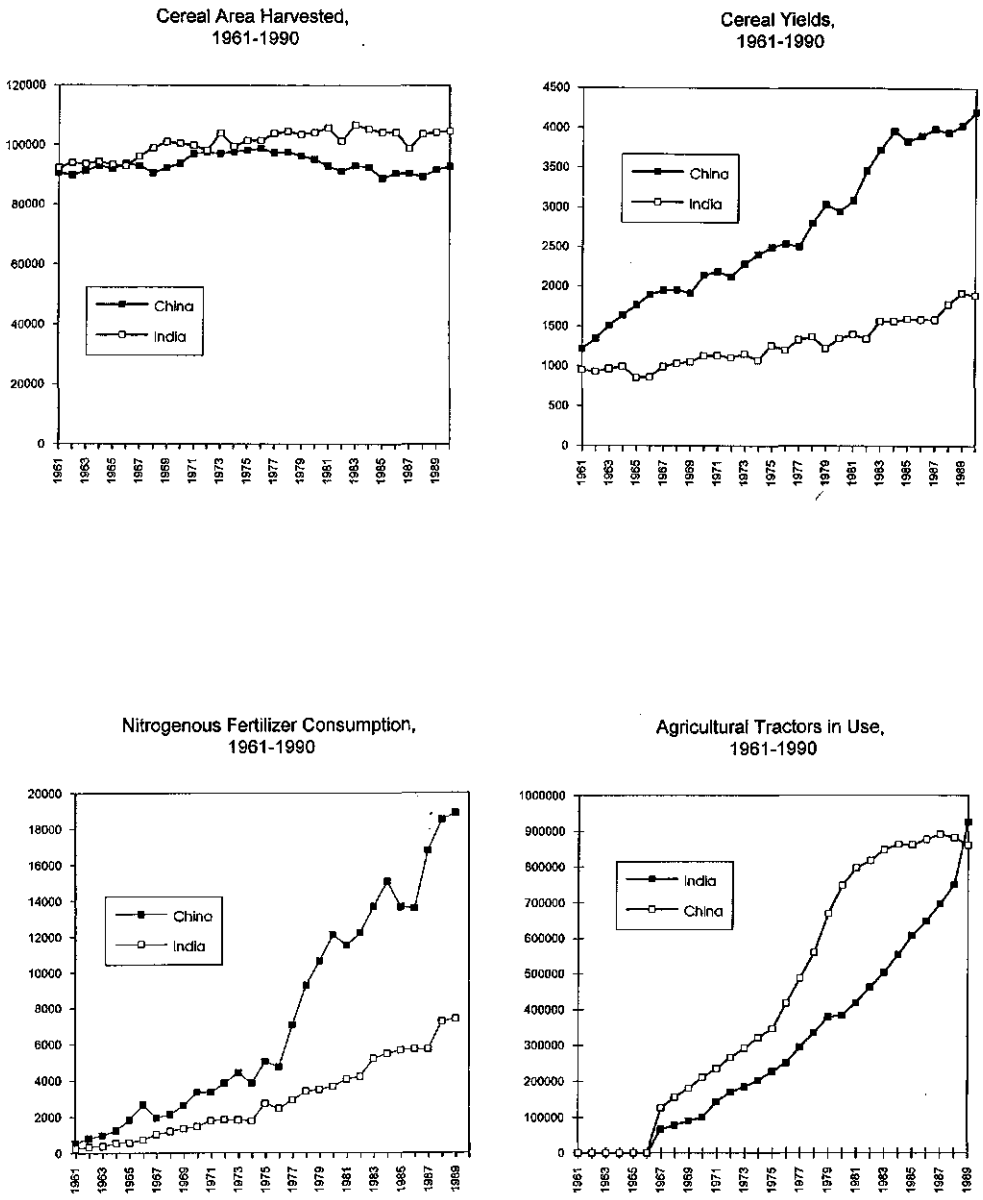

Fig. 1. Cereal production in China and India, 1961–1990. (Cereal area harvested is expressed in 1000 ha, cereal yields in kg/ha, nitrogenous fertilizer consumption in 1000 tonnes, agricultural tractors in numbers.)

such as to rotate food crops and leguminous species (clover, lucerne (alfalfa) or broad beans)[4], put manure on the field, or let it fall fallow for several years to let natural vegetation do the job. (For a more detailed discussion, see Hayami & Ruttan, 1985, pp. 45 ff.)

The most critical plant nutrients are nitrogen (N), phosphate (P_2O_5) and potash (K_2O). It is a characteristic of modern agriculture that farmers have learned to solve the problem of 'natural' soil degeneration by using fossil energy. The techniques of agro-chemistry have made it possible to produce plant nutrients in large quantities and recycle them to the soil. In combination with the breeding of new types of food crops ('high-yield varieties'), artificial methods of pest and weed control, and the development of irrigation systems, this led to a multiplication of yields all over the world.

Yields and fertilizer consumption

During the past decades farmers in Europe and Northern America have achieved spectacular yields by optimizing the input of plant nutrients and crop sanitation, by mechanizing cultivation, harvest and processing, and by adopting sophisticated crop rotation schemes. But this success story of modern agriculture is not restricted to the North. Most Third World countries could also increase food production: in China cereal production more than tripled between 1961 and 1988, and in Indonesia it more than doubled (Fig. 1). This expansion was not primarily achieved by expanding the area harvested, as is often assumed, but by increasing yields. The major factor was the enhancement of soil fertility through the input of 'artificial'[5] fertilizers (see Fig. 2). Only between 1961/63 and 1983/85 the consumption of fertilizers grew tenfold in developed countries and doubled in the developing world.

In fact, fertilizer consumption can be seen as a global indicator which characterizes agricultural 'regimes'. Fig. 3 shows the correlation between fertilizer consumption (in kg per hectare) and cereal yields (in kg per hectare) between 1961 and 1988 in Western Europe, in less developed Africa and in Asia.

- Africa, Asia and Western Europe represent entirely different levels of agriculture, cereal yield and fertilizer consumption differ by factors from 5 to 10. In 1988 the less developed countries of Africa had an average per hectare fertilizer consumption of some 11 kg and achieved cereal yields of some 1090 kg per hectare. Asian farmers on average applied some 115 kg of artificial fertilizers to their fields and

[4] Crop rotation is a frequently used, traditional technique to recycle nitrogen to the soil. By planting sweet clover after harvest and ploughing it under next year some 170 kg of nitrogen is added per hectare. The nitrogen fixation capacity of broad beans and lucerne is estimated to amount to 600 kg per hectare (Smil, 1987, p. 284).

[5] The term 'artificial fertilizers' is often used in a most pejorative sense as 'unnatural chemical substances'. However, the most widely used substances, such as nitrogen, phosphorus and potash, are natural components of fertile soils. They are 'artificially' removed with each harvest. Proper fertilizer use only maintains the natural fertility of soils.

achieved cereal yields of 2643 kg per hectare. By contrast, farmers in Western Europe harvested more than 4500 kg of cereals per hectare, using 225 kg of artificial fertilizers.

– Fig. 2, however, not only indicates regional divergence in fertilizer input, but also changes in time. There is a clear trend within each of the three regions: as fertilizer

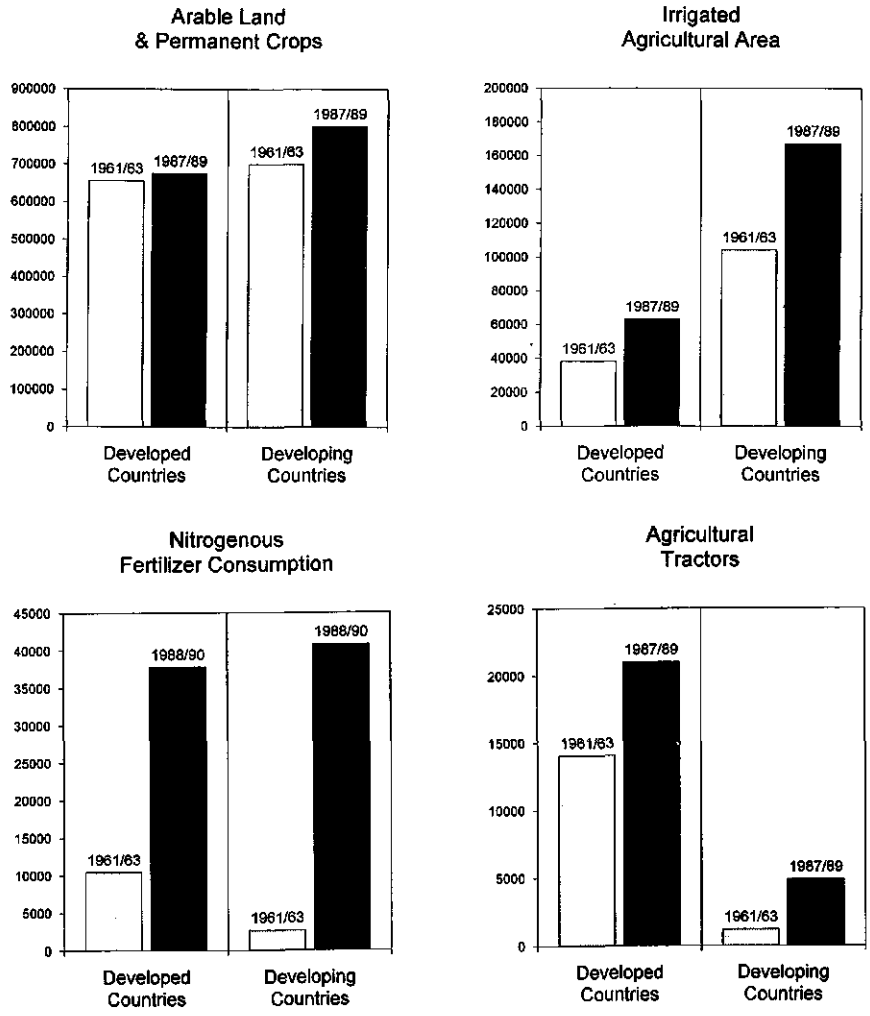

Fig. 2. Changes in selected inputs in agricultural production. (Source: Alexandratos, 1988, p. 31.) (Arable land is expressed in 1000 ha, irrigated agricultural area in 1000 ha, nitrogenous fertilizer consumption in thousand tonnes, agricultural tractors in numbers.)

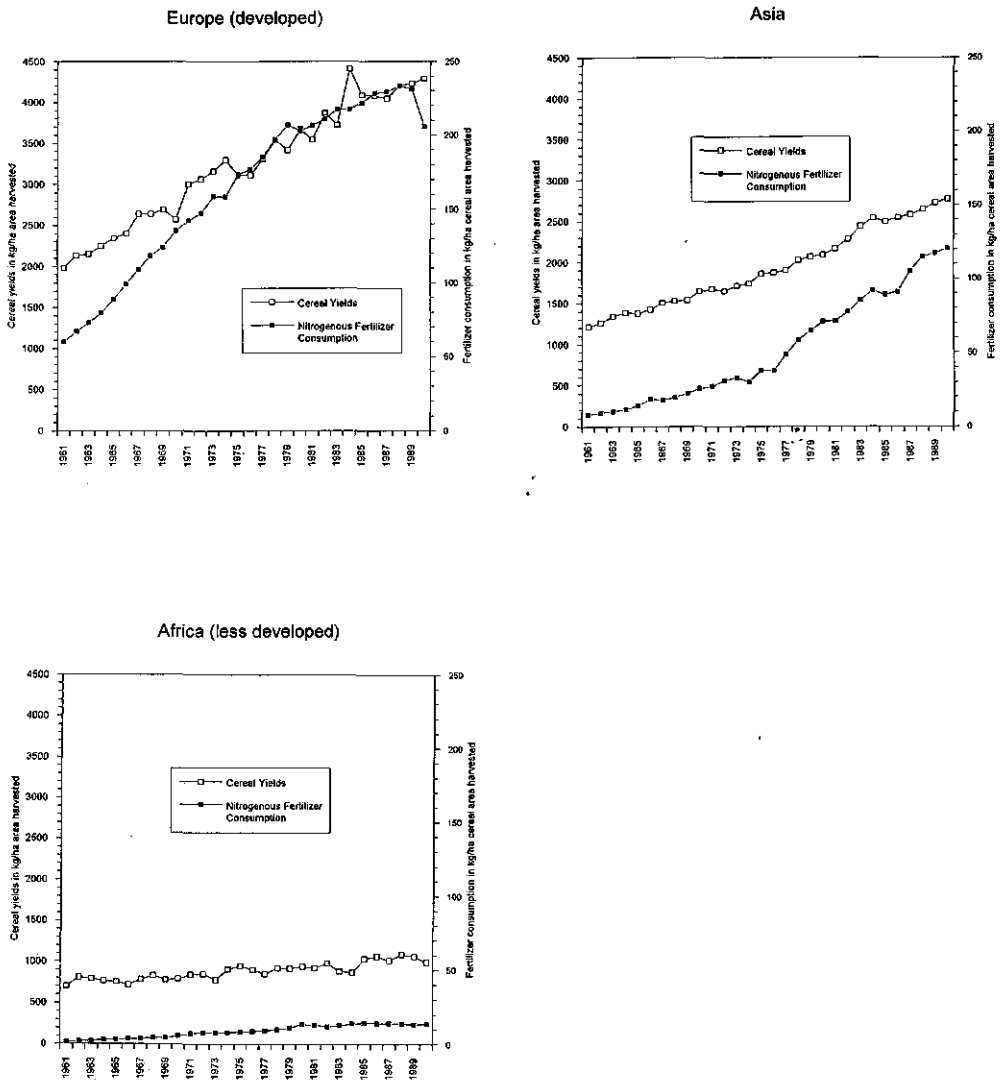

Fig. 3. Average fertilizer consumption plotted against average cereal yield in Western Europe, Asia and the less developed countries (LDCs) of Africa, 1961–1990.

consumption increased between 1961 and 1988, cereal yields also improved. In Asia per hectare fertilizer input grew by 106 kg, and cereal yields by 1431 kg. In Africa the usage of artificial fertilizers rose by 9 kg, but yields increased by some

387 kg. European farmers enhanced fertilizer input by 122 kg during the past three decades and increased average cereal yields by 2413 kg.

- While the correlation can be observed in all three regions, its strength varies greatly. For each kg increase of fertilizer input, cereal yields rose in Asia by 13.5 kg, in Africa by 43 kg, and in Western Europe by 19.8 kg, respectively. If we assume that fertilizer input is a major factor for raising soil productivity, Africa would gain most by an increase in fertilizer use. At the extremely low level of fertilizer input that is typical of African agriculture (except for Egypt and Lybia, whose farmers use very large amounts of artificial fertilizers, well comparable to Western European standards), each kilogram of additional fertilizer input would bring (and has, in fact, brought) great returns. In Asia, by contrast, the substantial increase of fertilizer input correlated only weakly with the slight increase of cereal yields, especially during the late 1980s.
- On a very high level of fertilizer input a substitution effect can be observed. During the 1980s cereal yields in Western Europe rapidly increased, while fertilizer input stagnated. Obviously the farmers managed to improve the productivity of their soils without increasing the input of fossil energy in the form of artificial fertilizers.

There can be no doubt that a whole range of factors other than fertilizer input can affect the productivity of soils. Climate conditions, such as average and peak temperatures, or the timing and amount of rainfall are very important. Also of great relevance is the 'natural' quality of the soil, the availability of high-yield seeds, access to irrigation, and farming know-how. But without the recycling of plant nutrients in the form of fertilizers made from fossil energy, no modern agriculture is possible (Stout, 1990). An FAO report states: 'The increase in fertilizer usage ... was possibly the most potent single factor in raising productivity ...' (Alexandratos, 1988).

Fig. 2 shows selected inputs to agricultural production between 1961/63 and 1983/85. Contrary to the widespread belief, the crop area expanded only slightly – in some parts of the world it even declined. There was only a minor expansion of the irrigated area. Fertilizer input, however, more than tripled (!) both in developing and developed countries. Obviously the major source of the worldwide increase in agricultural production was the productivity gain which is linked to the input of artificial plant nutrients, pesticides, fungicides, weed killers and other crop management chemicals. 'Instead of being limited by shortages of nutrients and water, and harmed by competition from weeds and attacks by pests, modern crops could come closer to reaching their full yield potential' (Smil, 1987, p. 286).

Agrochemistry has become a major factor in agricultural energy consumption. In advanced agriculture nitrogen fertilizers are the single largest sink of fossil energy. It typically accounts for no less than a third, but in some case up to 90%, of all external energy invested in agricultural production. However, it is very difficult to estimate the total amount of fossil energy that – directly and indirectly – goes into agriculture.

According to estimates from the early 1980s one needs 61.7 MJ of fossil energy to produce one kilogram of nitrate fertilizer, 12.6 MJ for 1 kg of phosphorus and 6.7 MJ for 1 kg of potassium (Lockeretz, 1980, pp. 23-24; Pimentel, 1984, p. 11). More recent calculations, however, are somewhat different, estimating ca. 52.9 MJ for the

production of 1 kg nitrate fertilizer, between 6.3 and 4604 MJ for 1 kg of phosphatic fertilizers[6] and 7.0 MJ for the production of 1 kg potassium.[7]

Worldwide, some 70% of the nitrogen fertilizers are produced from natural gas (Stout, 1990). Today we need about 1 m^3 of this gas to produce 1 kg of nitrogen fertilizer. Worldwide nitrogen fertilizer production from natural gas consumes a little less than 1% of total (global) energy consumption. Even in the developing countries, where agriculture is still a major sector, only 2.7% of total commercial energy use is in the form of fertilizer. In other words, compared to the energy use in industries or households the energy consumption in agriculture is very small (Smil, 1987).

It is true that a large proportion of fossil energy use in agriculture goes to the production of nitrogenous fertilizers – but total agricultural energy use, including fertilizers, averages only some 4% of overall commercial energy consumption. In absolute terms, the use of fossil energy for fertilizers is only of minor significance. Thus, fertilizer production is a very good investment. By spending just roughly 1% of world energy consumption on fertilizer production (and an additional 2% or 3% on agricultural mechanization, irrigation, transport, etc.) we have multiplied global food production and saved the life of hundreds of millions of people.

I am well aware that agro-chemistry has its negative side. In some critical areas one can certainly identify environmental and public health risks of excessive pesticide and fertilizer use. However, these problems are small compared with the consequences of agricultural stagnation. Without the application of artificial fertilizers and crop sanitation chemicals it would not have been possible to double or triple crop production during the past three decades in India, China and several other Asian countries. There would be a food production deficit for hundreds of millions of people and widespread famines would flare up frequently – as before the 'Green Revolution' (see also Pimentel, 1989).

Energy output/input ratios in selected food production systems

In the USA, agriculture energy input and yields in maize production changed dramatically between 1945 and 1985. Maize yields (measured in food energy output) more than tripled, and total energy input quadrupled. Overall energy efficiency – which is the energy output/input ratio – declined from 3.4 to 2.9. However, it was not overall energy consumption but the pattern of energy use that changed most. There

[6] The enormous range results from different processes for the production of phosphoric fertilizers and their base products. For the production of (ordinary or granulated) 'super-phosphates' from ground phosphate rock one needs only some 6.3 MJ of energy per kg fertilizer. However, to produce 1 kg of phosphoric acid from phosphoric rocks, one needs between 22.1 (wet process) and 129.1 MJ (acid oxidation method). The most energy-consuming process is the transformation of phosphoric acid into ammonium phosphates which requires 4604 MJ per kg. (All data from Brown et al., 1985.)

[7] These estimates include both fossil and non-fossil energy consumption, such as electricity from water-driven power plants (Brown et al., 1985, pp. 212-214).

Table 2. USA: energy input in maize production, 1945–1985, in MJ/ha (adapted from Pimentel, 1990).

Activity	Energy input			
	1945		1985	
	in MJ	in %	in MJ	in %
Labour	130	1.2	25	0.1
Machinery	1,701	16.3	4,255	9.9
Draught animals	0	0	0	0
Fuel	5,969	57.3	5,342	12.4
Manure	–	–	–	–
Fertilizers	974	9.3	15,650	36.3
Lime	192	1.8	560	1.3
Seeds	673	6.5	2,174	5.0
Insecticides	0	0	251	0.6
Herbicides	0	0	1,463	3.4
Irrigation	522	5.0	9,405	21.8
Drying	38	0.4	3,177	7.4
Electricity	33	0.3	418	1.0
Transport	184	1.8	372	0.9
Total input	10,416	100	43,092	100
Yields	35,647		123,728	
Yield/input	3.4		2.9	

was a sixteen-fold increase of energy input in the form of fertilizers (from 979 to 15,725 MJ/ha). The energy input for irrigation grew eighteen-fold (from 525 to 9450 MJ/ha). On the other hand, fuel consumption and labour input declined (from 5998 to 5368 MJ/ha and from 130 to 25 MJ/ha, respectively). In 1985, the products of agro-chemistry (fertilizers, insecticides, herbicides) accounted for some 40% of total energy input to maize production; in 1945 their share was only 9.3% (see Table 2).

The heavy use of (fossil) energy in modern agriculture – mainly through the use of artificial fertilizers – is reflected in very low energy output/input ratios in the production of certain food products. One needs, for instance, 5 MJ of fossil energy to produce lettuce with a food energy content of just 1 MJ. Such low returns are typical of a variety of vegetables. Tomatoes need 1.7 MJ input for 1 MJ output; and to produce cabbage with an energy content of 1 MJ one needs 1.25 MJ of fossil energy. By contrast, the energy output/input ratio in food and feed crop production is much better: by using 1 MJ of fossil energy (for fertilizers, machinery, irrigation, etc.) US

Table 3. USA: output/fossile energy input ratios and labour input per hectare for selected crop and livestock production systems.

Crop/livestock	Output/input ratio	Labour input per ha (man-hours)
Maize (USA)	3.5	12
Wheat (North Dakota)	2.7	6
Rice (Arkansas)	1.1	30
Beans, dry (Michigan)	1.3	19
Apples (East)	0.9	176
Oranges (Florida)	1.7	210
Potato (New York)	1.4	35
Lettuce (California)	0.2	171
Tomato (California)	0.6	165
Cabbage (New York)	0.8	289
Beef	0.04	2
Pork	0.02	11
Sheep (grass-fed)	0.01	0.2
Eggs	0.06	19
Catfish	0.03	55

Source: Pimentel (1984).

farmers can produce oats with an energy content of 5.1 MJ, soya bean equivalent to 4.5 MJ, and maize with an energy content of 3.5 MJ. However, the most widely used food crops, wheat and rice, are relatively energy-inefficient in modern production systems. To produce 1 kg of wheat with an energy content of 3.3 MJ, US farmers need 1.24 MJ of fossil energy (an output/input ratio of 2.7:1). The returns in rice production are even less favourable: US farmers need 2.6 MJ of fossil energy input to produce 1 kg rice of 2.9 MJ energy content (output/input ratio 1.1:1).

The relatively high energy consumption in rice production is not a typical result of US dissipation of energy. According to estimates by Wen Dazhong and David Pimentel the energy output/input ratio of rice production in Dawa County, Liaoning Province, China, was also only 2.6:1, which is slightly less than the energy efficiency of US wheat production. Pathak & Bining (1985) conducted a study on energy use patterns in rice-wheat cultivation in three clusters of Punjab villages, India. They found that energy consumption in rice production was much higher than in wheat production, primarily due to the high irrigation requirements of rice. They calculated total output/input ratios for commercial energy ranging between 1.4:1 and 1.81:1 in rice production and between 3.02:1 and 3.45:1 in wheat production. Table 3 lists the energy output/input ratio and labour input for selected crop and livestock production systems in the USA.

Low energy returns of rice are typical of all modern production systems, in the

USA as well as in Asia. Only traditional systems of rice production are more energy-efficient. In the Philippines output/input ratios between 5.5:1 and 10.5:1 can be observed in traditional rice farming. As these production systems have yields of only 1250–2700 kg/ha, growing population pressure will force the farmers to modernize in order to increase yields; this in turn will inevitably force them to increase fossil energy input (Baozhao & Kekuan, 1989).

Considering the food preferences of – at present – some 3000 million Asian people, the relatively high energy consumption in modern paddy rice production is an important factor in future energy use in food production systems. Since Asian populations are projected to increase by some 2000 million over the next 35 years (UN medium variant), we have to expect a significant increase in energy consumption in agriculture, in particular for the production of fertilizers. On the other hand, this might be a good investment: one cannot eat fossil fuel, but one can eat rice and wheat.

Unfortunately, many analysts have attached a negative image to the use of fossil energy in agriculture, implying that a low energy input/output ratio is bad, while a high one is good. In the name of energy conservation and environmental protection they propagate the ideology of traditional agriculture. One can find authors that make people believe that the Third World could survive on shifting cultivation. But these analysts ignore the simple fact that without fertilizers and pesticides there would be much less food around for the rapidly growing population. They should first answer the question of M. Slesser: '...what's wrong with using energy to get food?'

Future energy requirement in food production

In 1990, the world grain production was 1955 million tonnes, consisting of 595 million tonnes of wheat, 518 million tonnes of paddy rice and 841 million tonnes of coarse grain (FAO, 1990). On the basis of a food demand projection made by the Organization for Economic Co-operation and Development (OECD, 1979) the Indian agricultural expert S.K. Sinha has tried to estimate global energy use in future grain production. For the year 2000, Sinha assumed a garin requirement of some 2412 million tonnes (600 million tonnes of wheat, 634 million tonnes of rice, 1187 million tonnes of coarse grain). He estimated on the basis of US agricultural technology that one would need an amount of fossil energy equivalent to some 264 million tonnes of oil to achieve this output. In contrast, energy requirement would be equivalent to only 92 million tonnes of oil if Indian technology is taken as the basis for calculations (Sinha, 1986).

Unfortunately, Sinha's projections were not very realistic. He projected, for example, that the developing world would need some 1016 million tonnes of grain by the year 2000. In 1990, however, the developing world already produced more than that (ca. 1020 million tonnes). Obviously, Sinha underestimated considerably the increasing potential (and need) for grain production in the Third World.

It is very difficult to project future *overall* energy demand in agriculture; it will depend in part on factors that are impossible to predict, such as a possible break-

through in the bioengineering of new types of crop plants that can generate nitrogen or the development of new energy-saving irrigation schemes. Most important, however, there could be worldwide shifts in dietary patterns (such as increasing preference for food of animal origin) which would boost the demand for energy-consuming feed crops.

On the other hand, one has to remember that, worldwide, only a few per cent of commercial energy is used in agriculture (*including* fertilizer production, irrigation and farm mechanization). Much more fossil energy is used in the 'later stages' of the food chain, such as food processing, transportation and preparation (not to speak about the energy use in the industry). Even doubling of energy consumption in agriculture would be modest in its consequences relative to the total amount of energy consumed in the total food chain.

Processing, food trade and logistics

Research on energy consumption in the food sector is usually restricted to production of primary food products, such as rice, wheat, potatoes, fish or meat. But we no longer live from hand to mouth. Only rarely we eat plants as they come from the field or enjoy raw meat directly from a killed animal or fish. We rather prefer bread and cake, hamburgers and milkshakes, pork chops or 'Wiener Schnitzel', cheese and potato chips, wine and beer. From Beijing to Jakarta, and from Lagos to Mexico City the people of the earth have developed sophisticated techniques of food preparation which often reflect a particular national life-style.

The transformation of basic food into meals usually involves numerous industrial processes – from the grinding of grain, to the freezing of vegetables, the canning of meat and fish or the bottling of drinks. Food products are stored, transported to markets and distributed to households or restaurants. There they are transformed again into a near endless variation of dishes. Cooking food can be as simple as roasting a piece of meat on an open fire and as complex as preparing an 'haute cuisine' meal with 12 courses (and substantial fossil and human energy consumption in the kitchen). In any case, each step in the long food chain from the farm to the market and from there to the table needs fossil energy – usually much more than what is necessary to produce the raw product.

Especially in the industrialized world the fossil energy inputs in processing, preserving, packaging, and transport of food are enormous. Altogether some 30% of the total energy consumption in developed countries is consumed in the food sector: 10% of this energy is used in agriculture and livestock production, but 90% is spent for transport, packaging and preparation of food.[8] To produce one unit of food energy

[8] These are the most recent estimates available to me. There are older calculations which estimated a somewhat smaller energy consumption in the food sector of ca. 20% (including 5% for food production) of total fossil energy consumption in developed countries (Leach, 1977).

(vegetable food plus meat) we need about 0.6 units of fossil fuel in the industrialized countries, but processing, transportation, storage, and cooking of this food consumes at least another 6 units of fossil fuel per unit of food energy (Schmidt, 1986).

Preserving and packaging

In the late 1970s, David Pimentel calculated that 'producing sweet corn on the farm uses only about 10% of the total energy used to produce, process, market, and cook a 1-kg can of sweet corn.' (Pimentel, 1984). Freezing as a means of preservation is even more energy-consuming. One needs ca. 33.5 MJ/kg for freezing food compared to 27.5 MJ/kg for canning. An energy-efficient technique of preservation is salting. In former times this method was frequently used for safe storage of fish, meat and vegetables. According to Pimentel the process consumes only about 97 kJ per kg meat (not counting the fossil energy for producing the extra bottle of beer, wine or mineral water necessary to stop the burning thirst after the consumption of over-salted food).

Transport

While industrial processing and packaging of food by itself can consume up to ten times the energy necessary for production, its transport can use up even more. Consider the import of tropical fruits, coffee or tea to Europe! During the late 1970s David Pimentel has tried to estimate the energy costs of food transport in the USA by assuming an average transport distance of 640 km and a proportion of 60% truck and 40% rail transport. He concluded that the energy input of transport was about 1.5 MJ per kg food. However, Pimentel himself was obviously not happy with this estimate, since he added the example of a lettuce transport by truck from California to New York. This required about 7.6 MJ of fossil energy per kg lettuce, which is 36 times (!) the energy content of the food. Today it is even more difficult to give a general estimate of energy consumption in the food transport sector. There are many food products that virtually have travelled around the world before they are eaten by a consumer, such as Kiwi fruits from New Zealand sold in Europe, Egyptian bread baked with Canadian wheat flour, Argentinean sirloin meat consumed in European 'steak houses', or South African oranges that can be bought in northern Sweden.

Logistics

It is one thing to bring potatoes to the market and another to ship food or food components back and forth within a complex network of distributed processing, packaging and marketing sites. While the first activity can be called the transport component in the food chain, the second is a highly sophisticated organizational scheme to minimize costs in the food processing and marketing sector. It should be distinguished from the first kind of activity and called the logistics of the food system. Energy consumption in international food trade is only the tip of the iceberg. The hidden form of energy consumption which is associated with the complex network of

material flows between interlinked processing, packaging and marketing units in modern food industries is much more important. Sometimes these logistics are rather absurd. For example, potatoes harvested on German fields are carried to Italy, where they are washed and packaged – only to be transported back again to be marketed in Germany. It is not unlikely that some of these potatoes – now as packaged potato chips – cross the Alps for a second time from Germany to Italy. Milk and milk products are also transported excessively back and forth across large distances between European countries – supposedly to be brought to the most cost-efficient dairy plant for being processed into butter, cheese, yoghurt, etc.

Only recently Austrian politicians protested at the European Community against the excessive and unnecessary food transports between Germany and Italy. They argued that the traffic on the transit routes through Austria could be significantly reduced if these food transports were terminated. However, one has also to take into account that the concentration and specialization of food industries inevitably causes a certain redistribution of the raw product. A case in point is milk processing. In Europe, dairy factories have specialized to such an extent that some only produce a certain kind of milk product (such as yoghurt) while others, somewhere else in Europe, have specialized on other products. The material flows in the food industries are optimized according to cost efficiency and optimal allocation of production capacities rather than according to energy efficiency. As long as fossil energy is relatively cheap, excessive transport of food products for optimal processing and marketing will continue.

The logistics of food are often ignored in food studies, probably because it is almost impossible to sort out the complex network of ever-changing flows between farmers, processing industries, packaging sites, exporters and importers, wholesalers, retailers, and households.

Social and cultural aspects

Eating is not only a matter of energy intake or protein supply. Otherwise soya meat would have been a big success, as well as sea weed salads and synthetic food. There are at least five social and cultural components of food.

- People choose food according to taste; and tastes are rather different. If people do not like the taste they sometimes would not eat the food even if they starve to death. There are numerous examples where people in the middle of a famine refused to eat 'strange' food, such as eggs, fish, testines, animal blood, insects, snakes, frogs or snails - food that other people in other cultures would consider delicacies. Sometimes it requires substantial fossil energy input to achieve the right taste in food preparation, such as roasting coffee beans or smoking salmon.
- People eat with their eyes and within a typical social setting. Most of us prefer to drink wine from a glass (drinking it from the bottle would save the fossil energy that is required to produce and wash the drinking glas). Some of us prefer to eat at a nicely set table (much fossil energy is spent on producing and washing the table cloth and the porcelain dishes).
- There is a religious and symbolic dimension of food. Almost all religions have

certain food taboos and rituals of eating. For Christians bread and wine is something special, Jews prefer kosher food, Moslems avoid pork and alcohol. People adhering to alternative life-styles treat themselves with müsli and shiver from abhorrence at hamburgers with ketchup. Some environmental activists would never eat an Argentinian sirloin steak because they think they would otherwise help destroy the environment. This symbolic and ritual dimension of food has energetic consequences in that it restricts the diet to types of food that often need more (or less) energy input than a broader range of food items would require.

- Food can be a drug. Especially in developed countries the number of people with pathological eating habits is substantial. It would be interesting to calculate the fossil energy consumption required just to produce the additional food for people who simply eat and drink too much.
- Food has an entertainment aspect. There is a whole industry that produces what could be called 'entertainment food' – food that is usually not eaten because of its nutritional content but because of its 'fun and taste' features. Icecream, candy bars, popcorn, candy floss, chocolate Santa Clauses, Easter bunnies, chewing gum, and the whole range of sweets for children are examples. They are not required for a healthy diet (rather the opposite!), but eaten for a special experience. A recent trend in this industry is to combine food with toys ('children's surprise').

Strange enough, these social and cultural aspects of food are usually ignored in studies of energetic efficiency in the food sector. It is so strange because there can be no doubt that – at least in developed countries – they are responsible for most of the fossil energy consumption in our food chains.

Global trends in food preferences

To get a first overall impression of the global trends in food consumption patterns Table 4 was compiled. It shows the average food energy supply of major regions by selected categories (in kJ per caput per day) as well as the changes between 1961 and 1989.[9]

Worldwide there is a trend towards better food energy supply: it increased by 19.8%. Both vegetable and animal products contributed equally to this increase. However, as it is often the case with the global food situation, the overall trend is rather misleading. Broken down by major regions, different patterns become visible.

- In less developed Africa there is a trend to vegetable food. Whereas food energy supply based on animal products increased by only 2.2% between 1961 and 1989, energy supplied by vegetable food grew by over 10%. This is remarkable since Africa already had the highest proportion of vegetable food in total energy supply. Total energy supply increased only slightly (9.6%) during the past three decades.

[9] The data can only give a crude estimate of real food consumption patterns, since they represent average per caput food supply in a given country. Nothing is said about whether or not this supply is actually used for consumption.

Table 4. Food supply patterns (in kJ per caput per day) for selected categories, 1961 and 1989.

Category	World			Africa (LDCs[1])			Latin America		
	1961	1989	change in %	1961	1989	change in %	1961	1989	change in %
Grand total	9455	11328	20	8485	9296	10	9861	11420	16
Vegetable products	7947	9518	20	7921	8719	10	8214	9434	15
Animal products	1508	1810	20	564	577	2	1647	1986	21
Cereals	4694	5789	23	3904	4356	12	3963	4406	11
wheat	1739	2224	28	644	961	49	1379	1568	14
rice	1676	2312	44	372	610	64	861	1108	29
barley	105	46	–56	180	146	–19	26	13	–50
maize	514	681	32	1099	1333	21	1634	1680	3
rye	159	50	–68	0	0	0	1	0	–100
oats	21	17	–20	0	0	0	13	17	33
millet	196	155	–21	589	573	–3	0	0	0
sorghum	255	180	–30	836	623	–26	33	17	–50
other cereals	33	25	–25	180	105	–42	8	4	–50
Sweeteners etc.[2]	823	991	20	301	460	53	1576	1835	16
Vegetable oils	472	895	89	464	711	53	506	1258	149
Meat, offals	568	840	48	272	238	–12	849	966	14
Starchy roots	748	589	–21	1801	1864	4	711	543	–23
Milk	481	472	–2	163	184	13	485	598	23
Alcoholic beverages	230	276	20	192	163	–15	222	284	28
Fruits	222	272	23	368	343	–7	456	481	6
Animal fats	309	272	–12	59	59	0	217	242	11
Pulses	372	242	–35	397	380	–4	548	401	–27
Vegetables	155	192	24	92	100	9	92	109	18
Oil crops	159	188	18	284	238	–16	109	71	–35
Fish, sea food	71	113	59	46	67	45	38	63	67
Eggs	71	100	41	17	25	50	54	108	100
Other items[3]	79	100	21	125	109	–13	38	54	44

[1]Least developed countries.
[2]Sweeteners and sugar crops.
[3]Tree nuts, spices, stimulants.

– There is an opposite trend in the Far East. Whereas overall energy supply grew by 37%, food energy based on animal products increased by over 144%. In 1961 these Asian countries, in fact, had lower food energy supply from animal products than the developing nations of Africa (377 as compared to 564 kJ per caput per day).

Table 4 (continued). Food supply patterns (in kJ per caput per day) for selected categories, 1961 and 1989.

Category	Far East[1]			Near East[2]			MDCs[3]		
	1961	1989	change in %	1961	1989	change in %	1961	1989	change in %
Grand total	7457	10241	37	9300	12348	33	12682	14283	13
Vegetable products	7093	9342	32	8293	11161	35	9158	9911	8
Animal products	368	899	144	1007	1187	18	3528	4372	24
Cereals	4803	6901	44	5885	7135	21	4736	4163	–12
wheat	769	1935	152	3591	4903	37	3327	3035	–9
rice	2826	3988	41	619	853	38	543	502	–8
barley	117	25	–79	238	226	–5	67	25	–63
maize	418	556	33	677	731	8	247	326	32
rye	25	8	–67	104	17	–84	443	180	–59
oats	13	4	–67	0	0	0	46	46	0
millet	280	176	–37	109	46	–58	33	13	–62
sorghum	339	184	–46	548	355	–35	4	13	200
other cereals	21	21	0	0	0	0	25	21	–17
Sweeteners etc.[4]	401	552	37	594	1159	95	1463	1831	25
Vegetable oils	238	543	128	493	1271	158	819	1530	87
Meat, offals	113	468	315	351	460	31	1300	1944	49
Starchy roots	652	401	–38	150	255	69	727	552	–24
Milk	130	201	55	422	393	–7	1099	1154	5
Alcoholic beverages	46	117	154	25	29	17	556	723	30
Fruits	88	134	52	518	577	11	297	393	32
Animal fats	54	92	69	188	222	18	790	777	–2
Pulses	510	255	–50	192	255	33	138	100	–27
Vegetables	130	167	29	188	247	31	222	301	36
Oil crops	176	213	21	100	113	11	121	171	41
Fish, sea food	42	75	80	17	38	125	142	247	73
Eggs	21	63	200	21	67	220	176	226	29
Other items[5]	54	59	8	155	130	–16	96	171	78

[1] Far East: Bangladesh, Bhutan, Brunei, East Timor, Hong Kong, India, Indonesia, Rep. of Korea, Laos, Macao, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand.

[2] Near East: Afghanistan, Bahrain, Cyprus, Egypt, Gaza Strip, Iran, Iraq, Jordan, Kuwait, Lebanon, Lybia, Oman, Qatar, Saudi Arabia, Sudan, Syria, Turkey, United Arab Emirates, Yemen Arab Republic, Democratic Yemen.

[3] Medium developed countries.

[4] Sweeteners and sugar crops.

[5] Tree nuts, spices, stimulants.

Today, the people in the Far East are supplied with 899 kJ per person per day of animal-based food while in Africa only 577 kJ per caput per day are available.
- In Latin America the increase of energy supply from animal products was over 20%, but energy from vegetable products increased by only 15%.
- Energy supply in the developed world stems to a high degree from animal-based food. Roughly one third of total energy supply (of 14.2 MJ per caput per day) comes from animal products. Yet there is still a trend towards more animal food. Whereas vegetable energy supply increased by some 8%, energy from animal products grew by almost 24% since 1961.

In parts of the Third World large sections of the population seem to become fond of a more 'western' diet. They begin to dislike the – sometimes rather monotonous – food made out of traditional grains (such as sorghum, millet, or barley), pulses (including beans, peas, lentils, etc.) and starchy roots (including potatoes, cassava, yams, taro, etc.). In Latin America, for instance, the energy supplied by starchy roots declined by 23%, in the Far East even by 38%. Food energy supplied by pulses fell by 27% and 50%, respectively. The supply of eggs in terms of energy, however, doubled in Latin America and tripled in the Far East. The most spectacular change was the enormous increase of meat consumption in the Far East: between 1961 and 1989 the amount of energy supplied by meat and offals grew from 113 to 468 kJ per person per day (plus 315%).

Less developed Africa did not completely follow this trend. Here the food energy supply from starchy roots and pulses increased (by 3.5% and 7.1%, respectively) while it declined in Latin America, Far East and in the developed countries. The increase, however, was less than the growth of Africa's total food energy supply. Sugar crops and sweeteners also became more important for African food energy supply: in 1961 they added 301 kJ to overall food supply, in 1989 their contribution was 460 kJ per person per day. Among the large regions only the Near East (with its traditional preference for sweet food) had a higher proportional increase of energy from sugar crops and sweeteners. Most surprisingly, the developing countries of Africa had a significant increase of rice supply: between 1961 and 1989 food energy supplied by rice grew from 372 to 610 kJ per person per day.

On the other hand, traditional cereals, such as barley, rye, millet or sorghum, are loosing ground relative to wheat and rice. While in 1961 sorghum accounted for 836 kJ in average African food energy supply, it was only 623 kJ per person per day in 1989. During the same period wheat increased its share from 644 to 961 kJ and rice – as we have already mentioned – from 372 to 610 kJ. In the Far East food energy supplied by sorghum declined from 339 to 184 kJ per person per day, and in the Near East it fell from 548 to 355 kJ per caput per day.

The energy implications of these trends are multiple and difficult to quantify. A shift to 'modern' food crops such as wheat and rice will most likely amplify the need for agricultural modernization (including the use of artificial fertilizers and irrigation); this, in turn, will increase fossil energy consumption. Of even greater significance might be the rapid increase of meat supply in the developing nations of the Far East, which has quadrupled since 1961. (However, it should not be forgotten, that average

meat supply in the Far East today is still only one fourth of the level in developed countries.) Since the production of meat consumes much more fossil energy than that of food crops energy consumption will increase even further.

Life-styles and food consumption patterns

Food habits all over the world have changed fundamentally since the times of our grandparents. Today, no one in Europe or Northern America is surprised to find fresh salads on the market throughout the year. We have become accustomed to eating bananas, grapefruits or oranges at Christmas and ice cream or milkshakes in the mid-August heat. But this change in life-style is not restricted to the developed world. The citizens of Cairo, for instance, have developed a preference for white bread which can only be produced due to Egypt's enormous cereal imports. In many Third World cities the middle classes are increasingly becoming fond of 'western' food. One can easily eat hamburgers in Guatemala City, drink 'Coke' in Java or have a bottle of beer in Arusha, Tanzania. But all this is only possible due to an enormous input of fossil energy in the food transport and processing sector.

We can conclude that there are three major trends in food preferences that have a direct impact on the logistics of the food system.

- Simple, traditional dishes prepared from raw products in the household tend to be replaced with refined, industrially processed food. The worldwide success of fast food restaurants and ready-to-eat packaged food (chocolate bars, potato chips, yoghurts, etc.) is a symptom of this trend.
- Food consumption patterns no longer follow the seasonal circle. Fresh fruits and vegetables are marketed throughout the year, either from glasshouse production or imported from parts of the world that currently have a growing season for the product.
- In developed countries there is a trend towards 'exotic' food among certain groups of the population. Europe's food stores are filled with vegetables and fruits from the most distant places, such as mangoes, leaches and papayas. This indicates that the food chains are expanding from local or regional to international markets.

These trends have already caused a shift in energy use from the production of food to its transport, processing, storage and preparation. As the typical 'western' life-style is expanding to the Third World a strong increase in energy use in the food distribution and processing system can be foreseen. This will add to what must be expected anyway due to the increase of food production for the growing population.

The cultural dimension of animal food

Cycling crops through animals to produce protein is extremely inefficient, both in terms of land and energy. According to a calculation of Pimentel (1984), the production of a diet rich in animal protein consumes about three times the fossil energy than is needed for pure plant protein food. To produce a daily food energy intake of 13.8 MJ one needs 142 MJ of fossil energy for a diet rich in animal protein,

79 MJ for a lacto-ovo-vegetarian diet that includes eggs, milk and milk products, but only 41.4 MJ for a pure vegetarian diet. This calculation is based on the rather conservative assumption that the diet high in animal protein includes 100 g of animal protein per day. There are, however, many people who consume a substantially higher amount of animal protein per day. More recent estimates are even more pessimistic in assuming that producing animal food requires up to fourteen times more input of fossil energy than the production of vegetable food.

During the past few years food experts and environmental activists (let alone physicians and dietary advisers) have spoiled our appetite for meat and meat products. They widely publish statistics and research reports which demonstrate that diets rich in animal protein and fats

- increase the probability of cholesterol-related diseases (ischaemic heart disease, stroke),
- trigger environmental destruction (cattle ranging in tropical forests, groundwater pollution due to excessive amounts of manure),
- change the pattern of agricultural production from food to feed crops, and thus
- plunder the world (food) resources at the cost of the hungry in the Third World.

Besides the high energy and land waste in livestock production there are obviously a number of good reasons to decrease the consumption of animal protein. Why is it then that in most parts of the world (with the exception of Africa) the consumption of meat and meat products is increasing? This can only be understood if one considers the cultural dimension of animal food.

Many people in Northern America and Europe are accustomed to protein-rich diets comprising (red) meat and other animal products, such as sausages, milk, cheese and animal fats. These diets are so typical that they contribute to a people's definition of cultural identity. American 'T-bone steaks', German 'Würste', or French 'fromage' are more than just categories of food. To a certain extent they represent a way of life. A large majority of Americans would hardly celebrate the 4th of July other than with a barbecue of pork chops or spare ribs. And an American 'Thanksgiving' would certainly not be the same without a turkey. It would also be difficult to find someone ordering 'fish' and mineral water in a Bavarian village pub instead of a solid joint of pork ('Schweinebraten') and a beer. French cheese is a matter of national pride and political relevance.[10]

This link between culture and (animal-based) food is not only typical of Europe and Northern America. There are several Third World countries where diets rich in animal protein are quite popular. The Balinese national food, for instance, is roasted 'suckling pig'; the Chinese like 'marinated ducks' and numerous dishes made of pig meat and

[10] The French Ministry of Education has set up a course in primary schools where small children learn to savour the taste of French cheese (and that of other original French food, such as red wine or baguettes) in order to prevent them from falling prey to the global 'junk food' of hamburgers, French fries and Coke. The 'taste training', as they call it, is reported to be very popular.

pig offals; and in the Islamic world sheep meat is eaten not only at religious ceremonies. Even in India, which is usually considered the most typical vegetarian country, some 7% of total food energy supply came from animal products (mostly milk) in 1989. In Somalia, which has a large population group of nomadic cattle rangers, more than 30% of total energy was supplied by animal products. Some twenty years ago, the diets of the Somalians consisted of even more animal protein: 42% of the food energy came from animal products, mainly milk. Diets rich in animal protein are also typical of the following countries: Uruguay, Libya, Argentina, Kuwait and Korea. As Third World countries develop, a growing section of their population will be able to afford meat and other animal products. This will most likely increase the worldwide shift to animal-based food. China, for instance, has already increased its meat production between 1961 and 1988 from 3 kg to 23 kg per caput per year.

Low-energy food

The cultural dimension of food is not restricted to the traditional preference of certain (animal food) diets, the worldwide success of fast food restaurants, the widespread consumption of 'exotic' food, or the consumption of seasonal fruits and vegetables during the whole year. Alternative life-styles within the developed countries emerging during the past decades are linked to certain nutritional patterns (Galtung, 1976). A recent trend is the fitness movement, symbolized by skinny joggers and slim aerobic dancers. Trimming weight is their belief, and 'low-calorie food' is the means to achieve it.

From the perspective of fossil energy conservation, 'low-calorie food' is a disaster. By using artificial sweeteners (Nutrasweet), water-oil emulsions and some other 'tricks' of modern food technology to reduce the natural energy content of a given food product, the industry has managed to 'create' special types of food for those who are eager to reduce energy intake. Very often these products combine an extremely low energy content with the most extensive, energy-wasting packaging. A case in point are 'low-calorie' soft drinks, such as 'Cola light'. The food 'energy' provided by the drink is a tiny fraction of the energy needed to produce it, blow the bottle, fill it, carry it to the food store, bring it home and open it. There is a wide range of products in our supermarkets, from margarine and cheese ('Du Darfst') to sausages and chocolates, where special food preparation techniques (with a high energy use) are used to decrease the energy content of the product. Instead of simply eating less, people in the developed world tend to eat more energy-reduced food.

'Luxury food'

A most interesting example of energy use in the food sector can be found in the marketing and consumption of 'high prestige' food. A typical case is mineral water. This product is no longer a simple bottle of water containing more or less minerals. It has become a brand-name product, which is often carefully selected by consumers, who expect to find their special type wherever they travel. Only recently an Austrian

producer (Vöslauer) proudly announced that he is shipping his water all over the earth, from Canberra to New York. In its physiological effect the Austrian mineral water is probably not much different from similar water bottled in Australia or the USA. It is obvious that the enormous amount of energy used for shipping water around the globe has nothing to do with its primary function of quenching thirst. It satisfies the desire for a certain life-style. Many types of 'luxury' food, from Russian caviar to Canadian salmon, that are distributed worldwide to first-class hotels, restaurants and food stores are using up unusually large amounts of fossil energy.

Is it possible to calculate the energy costs of (dietary) life-styles?

The energy use in 'low-calorie' food products and in certain kinds of 'luxury food' indicate the need for a reorientation in energy analyses. The conventional approach of calculating energy output/input ratios for certain products is no longer appropriate. If the food energy content of a product is negligible in comparison to its fossil energy consumption in transport, packaging and preparation, the widely used output/input ratios loose their meaning.

But this is not the only difficulty. While it is certainly necessary to consider all possible sinks of fossil energy in a food chain (and not only in the production of the primary product) in order to calculate the 'real' energy consumption of a diet, we can easily find ourselves on rather uncertain ground. Should we, for instance, also include the fossil energy that is needed in advertising food? Should we include the energy consumption of hospitals for treating food-related diseases?[11] The consumption of Vichy mineral water imported from France and of locally produced wine might use up a similar amount of fossil energy (used in producing, bottling and transporting the product). But the health consequences of these 'diets' could easily shift the overall energy balance to the side of the more 'healthy' product by avoiding the energy costs of alcoholism.

This is not the place to further explore these questions. They should only create awareness of the fact that nutrition is a rather complex social, cultural, and economic phenomenon. Probably it will never be possible to find a general measure of energy efficiency in the food sector, since its definition strongly depends on the scope and perspective of the research design. One thing, however, is certain: understanding the patterns of energy consumption in food chains would be much easier if fossil energy prices would better reflect the true costs of energy use.

[11] Physicians and dietary specialists often argue that in the highly developed countries of Northern America and Europe more people are killing themselves with 'fork and spoon' than by any other means.

Conclusions

This paper argues that the energy efficiency of food must be analysed for whole food chains, including production, harvesting, slaughtering, processing, storage, transport and preparation in the household. The major considerations are summarized below.

The shifting balance of energy use in food chains

The supply of food is one of the most energy consuming tasks in a society. Even in highly industrialized countries more fossil energy is spent in the food sector than in industry. Usually some 30% of the overall fossil energy consumption is used just for feeding the population. This, however, includes everything – from the production of fertilizers and agricultural machinery to the fueling of irrigation pumps and drainage systems, and from energy use in cultivation and harvesting, to energy consumption in processing, storage, transport and preparation of food. Obviously, the 30% figure is a very rough estimate. It is extremely difficult, if not impossible, to take into account the energy consumption in each and every link of our widely expanded food chains. In rural parts of the Third World the proportion of fossil energy used in the food sector might well be close to 100%; in highly industrialized countries it is probably less than 30%.

Only a small – and declining – proportion of total fossil energy consumption in the food sector is spent on food production; most of it (some 90%) goes to processing, storage, conservation, transport and preparation of food. Contrary to conventional wisdom, it is not the high-tech farmers who are responsible for the enormous energy consumption in the food sector. It is the food industries, food traders, restaurants and households which spend most of the fossil energy in the food system. This is the reason why life-styles are much more important in studying energetic efficiency in food chains than the frequently analysed output/input ratios in agricultural production.

Agricultural productivity

While only some 10% of overall energy consumption in the food system is spent on food production, fossil energy is still very important for boosting agricultural productivity. It is the transformation of fossil energy into plant nutrients (fertilizers), weed killers (herbicides) and products for plant protection and pest control (pesticides, fungicides) that has made it possible to increase 'natural' soil productivity by a factor of 10 to 100 during the past 40 years. These technologies of agro-chemistry became firmly established throughout the world's farming systems, including those of poor countries like China, Indonesia or India. To put it very bluntly, during the past four decades we have transformed fossil energy into food to sustain a doubling world population. For this enormous productivity gain in food production it was necessary to spend roughly 1% (!) of global fossil energy consumption for fertilizer production. It is hard to find a better investment for this fossil resource.

Diets and life-styles

The distinction between food production and non-agricultural elements in our food chains is essential to understand the true energetic efficiency of certain diets. For instance, while the energy efficiency of (red) meat production might be rather low as compared to the production of cereals, vegetables or fruits, its processing, packaging and transport may be not. A large proportion of (red) meat in Europe is produced and marketed locally; for fresh meat there is virtually no packaging, since it is usually cut and sold across the counter from one large piece. It is easy to find popular vegetable food that uses up much more fossil energy than meat, such as Kiwi fruits harvested in New Zealand, flown to Europe, processed into a soft drink, filled into a glass bottle and distributed by lorry to thousands of local supermarkets.

'Health food' and 'low-calorie food' – which are often considered to be modern alternatives to 'traditional' protein-rich diets of (red) meat, butter, milk and eggs – are often quite energy-consuming. A diet of vitamin-rich, low-cholesterol food with a high proportion of fish, (exotic) vegetables and fruits might be among the most energy-consuming nutritional life-styles, especially if it includes industrially processed 'low-calorie' soft drinks, yoghurts, mineral waters, etc. There is no doubt that the biggest waste of fossil energy in the food sector is linked to 'luxury food', which is often transported half around the globe and requires a lot of energy for preparation and serving.

From the perspective of overall energy consumption it is only locally grown and fresh marketed cereals, vegetables and fruits that would be a true alternative to the energy-wasting diet of (red) meat, glasshouse-produced vegetables, tropical fruits and heavily packaged 'fast food'. However, many people in the developed world might find it rather difficult to return to a diet consisting of bread, porridge, millet gruel, vegetables of the season and a few local fruits.

References

Alexandratos N (ed.), 1988. World agriculture: toward 2000 – an FAO study. Belhaven Press, London.

Baozhao Z & Kekuan Y, 1989. Energy input for rice production in China and appraches of increasing efficiency. In: Proceedings of the International Symposium on Agricultural Energy (89-ISAE), Beijing, China, 12-15 September 1989, Vol. 2, pp. 916-920.

Binswanger HP, 1984. Agricultural mechanization. A comparative historical perspective. Staff paper 673. World Bank, Washington, DC.

Brown HL, Hamel BB & Hedman BA, 1985. Energy analysis of 108 industrial processes. Fairmont Press, Philadelphia, PA.

FAO, 1990. Production yearbook 44. FAO, Rome.

Fussel GE, 1967. The agricultural revolution, 1600–1850. In: Kranzberg M & Pursell CW (eds.), Technology in Western civilization, Vol. 1: The emergence of modern industrial society. Early times to 1900. Oxford University Press, New York/London/Toronto.

Galtung J, 1976. Alternative life styles in rich countries. Devel Dialogue 1: 83-96.

Grigg DB, 1981. Population growth and agrarian change. A historical perspective. Cambridge University Press, Cambridge.
Hayami Y & Ruttan VW, 1985. Agricultural development: an international perspective. John Hopkins Press, Baltimore/London.
Leach G, 1977, Energy and food production. IPC, Guidford. Cited in: Slesser M, 1986. Energy balance in agriculture: the developed world. In: Swaminathan MS & Sinha SK (ed.), Global aspects of food production. International Rice Research Institute (IRRI), Oxford/Riverton/Dehrad Dun (Tycooly International).
Lee RB, 1969. !Kung bushman subsistence: an input-output analysis. In: Vayda AP (ed.), Environmental and cultural behavior: ecological studies in cultural anthropology, pp. 47-79. Natural History Press, Garden City, NY.
Lockeretz W, 1980. Energy inputs for nitrogen, phosphorus, and potash fertilizers. In: Pimentel D (ed.), Handbook of energy utilization in agriculture, pp. 23-24. CRC Press, Boca Raton, FL.
OECD, 1979. Facing the future. OECD, Paris.
Pathak BS & Bining AS, 1985. Energy use pattern and potential for energy saving in rice-wheat cultivation. Energy in Agric 4(3): 271-278.
Pimentel D, 1984. Energy flow in the food system. In: Pimentel D & Hall CW (eds.), Food and energy resources. Academic Press, Orlando, FL.
Pimentel D, 1989. Impacts of pesticides and fertilizers on the environment and public health. In: Toxic substances in agriculture, water supply and drainage. Proceedings of the 2nd Pan-American Regional Conference, pp. 95-108.
Pimentel D, Dazhong W & Giampietro M, 1990. Technological changes in energy use in U.S. agricultural production. In: Glissman SR (ed.), Agroecology: researching the ecological basis for sustainable agriculture, pp. 305-321. Springer-Verlag, New York/Berlin.
Schmidt A, 1986. Food and energy. In: United Nations Economic Commission for Europe: Biotechnology and economic development. Papers from the Economic Commission for Europe Symposium on the Importance of Biotechnology for Future Economic Development (Szeged, Hungary, June 1985). Published in Econ Bull Europe 38(1). Pergamon, Oxford.
Sinha SK, 1986. Energy balance in agriculture: the developing world. In: Swaminathan MS & Sinha SK (eds.), Global aspects of food production. International Rice Research Institute (IRRI), Oxford/Riverton/Dehrad Dun (Tycooly International).
Slesser M, 1986. Energy balance in agriculture: the developed world. In: Swaminathan MS & Sinha SK (eds.), Global aspects of food production. International Rice Research Institute (IRRI), Oxford/Riverton/Dehrad Dun (Tycooly International).
Smil V, 1987. Energy, food, environment – realities, myths, opinions. Clarendon Press / Oxford University Press, Oxford.
Stout BA, 1990. Handbook of energy for world agriculture. Elsevier, London / New York.
Whitmore TM, Turner II BL, Johnson DL, Kates RW & Gottschang TR, 1990. Long-term population change. In: Turner II BL et al. (eds.), The Earth as transformed by human action. Global and regional changes in the biosphere over the past 300 years, pp. 25-39. Cambridge University Press, Cambridge/New York.

Nutrition surveillance: data information systems for the analysis of nutrition problems

The role of information in food and nutrition policy-making processes: a system analysis

M.R.H. Löwik

TNO Nutrition and Food Research, Zeist, Netherlands

Introduction

Several definitions of what the term 'policy' means are available in the literature. One of these is that policy is restricted to goals, plans etc. related to a particular aspect of society, in our case the food system. This definition implies that policy is made up of approved statements about the food system. This system consists in all activities within a country with the (ultimate) purpose of influencing the production, flow, quantity, quality and diversity of human food. A food system is not a random set of activities, but instead activities are structured within organizations (both private and public ones) and institutions (such as households) which can be seen as decision-making units engaged in activities pertaining to the food system. The activities within a decision-making unit are closely related and are therefore clustered (specialization according to function and similarity). The material flow in a food system is the primary process, whereas the non-material input and output, such as prices and legislation, make up the control system (Löwik & Hermus, 1988). A major element of the control system is policies resulting from the political system. This latter system can be seen as a set of institutions (or, more specifically, a set of decision situations), linked by ongoing (decision-making) processes, which pose (binding) policies upon society. For these processes information about the food system is needed to increase the efficiency and effectiveness of food and nutrition policies. To see what is the role of information in food and nutrition policy insight has to be gained into the way decision-making processes are structured and regulated.

A systems model of the State

A political system transforms input (demands of consumers, industry, etc.) from society into output, such as laws and programmes, whereas the environment of such a system needs to be studied as well (Fig. 1). The choices open to a political system can be seen as its policy space which has a major effect on the objectives and the way these are fulfilled. The policy space depends on the resources available to the political system, the prevailing ideology (such as freedom of choice), the relationship between

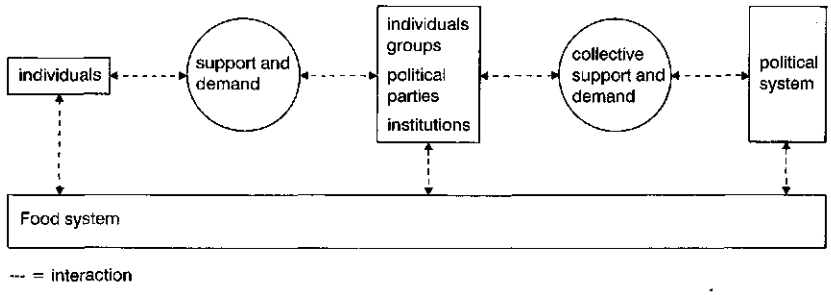

Fig. 1. Model of the environment of the political system.

the political system and society, and the political system's environment structure and processes. A major issue in the perception of policy space is the extent of acceptance of particular interventions by relevant actors in the policy-makers' environment. In case the political system is considering interventions to reduce fat consumption, nutrition information systems might come up with information on the acceptance of alternative interventions by the target group. For instance, Schmid et al. (1989) have shown that policies that would control sale conditions or product information were likely to meet the strongest public support. Taxation or excises as an incentive to food producers to provide alternatives to high-fat food or as a disincentive to consumers to purchase such foods meets moderate support. A proposal to limit the sales of high-fat foods to children was opposed most strongly.

Demands and support of individuals (whether organized or not) are signals from the environment that exert a certain pressure on the political system to act in a particular direction. According to Salter & Tapper (1982), the goals of the political system, or at least part of these, reflect the demands and support this system is given by its environment. These goals provide insight into the function of the organization in society, this function being defined by both the organization itself and its environment. Although an organization cannot ignore the social and political pressure exerted, it can interpret this pressure in a way fitting in with its ambitions. However, the policy space to do so is limited by the political system's environment. The power of the individual and of organizations and the characteristics of the problem represent the pressure on the political system.

Nutritional problems are individual problems dispersed throughout society, whereas a political system deals with collective problems. A political system can, of course, adopt the individual problems as a collective problem, and the likelihood of this will increase when macro-variables, such as costs of public health, budgetary constraints and inflation, are affected. Nutrition information systems play an essential role in the conversion of micro-problems to the macro-level of the political system in that the prevalence of nutritional risks and the expected impact on public health are assessed.

Consumers, organizations and the political system itself have a role in and a perception of the food system. These will result in (collective) support and demands of the various decision-making units. The boundary of a decision-making unit (for

instance a manufacturer of margarine) is determined by the (actual) control of that unit over activities (in this case processing of fat) belonging to the food system. Similarity of activities, and hence of interests, may lead to an (institutionalized) network of decision-making units in which a hierarchy is introduced leading to common demands that are to a certain extent a conversion of the original demands of the separate decision-making units. The collective support and demands from society are the input of a political system and can be seen as (information) signals (Kooiman, 1982). For instance, food safety is one of the demands of society. Despite the common notion among scientists that in affluent societies the health risks introduced by microbial infections, additives etc. are small in comparison with the effects of actual food choices on public health, consumers feel that food safety is of greater importance. In this case the political system tries to change the demands by providing information to the public such that the system is interacting with society to sustain support for its policy. The actors will evaluate this against their original demands and their (possibly changed) perception of the relevant context (dominant political ideology, economic situation, etc.) and act accordingly. As a matter of course, a policy aimed at changing the demands as to food safety can only be sustained as long as the results of nutritional information systems show that the original problem definition is correct.

Decision-making

The starting point of nutrition information systems should be the supply of relevant data for decision-making processes of the political system. A widely accepted nutrition information system will improve the interaction between a political system and its environment, since the discussions will concentrate more on the actual issues and less on methodological pitfalls and the validity of information sources. The role of nutrition information systems is basically restricted to data collection, analysis and interpretation. In an orthodox planning model it are the political actors who are responsible for the direction (substantive rationality), whereas nutritional information systems have to translate this direction into analytic procedures and methods (procedural rationality) that will generate the 'best' problem formulation and selection of the alternative for action to be taken. Introduction of value judgement into analyses does not imply that the policy process becomes irrational. The value judgements that 'guide' the analysis should be explicitly formulated such that the results can be reproduced and can be interpreted against the background of the values. Decision-making processes of the political system are influenced by the actors and their perception of the nutritional issue at stake as well as by the structure (decision-making units) and culture of the political system. It is within decision-making units, all with their own historical background, that individuals function according to their social role. Therefore the 'choice' of the channel of the bureaucracy that has to deal with a particular issue is of major importance, since various public organizations such as governmental departments have different goals and thus different criteria for decision-making (see Fig. 2). Decision-making processes are influenced by organizational and

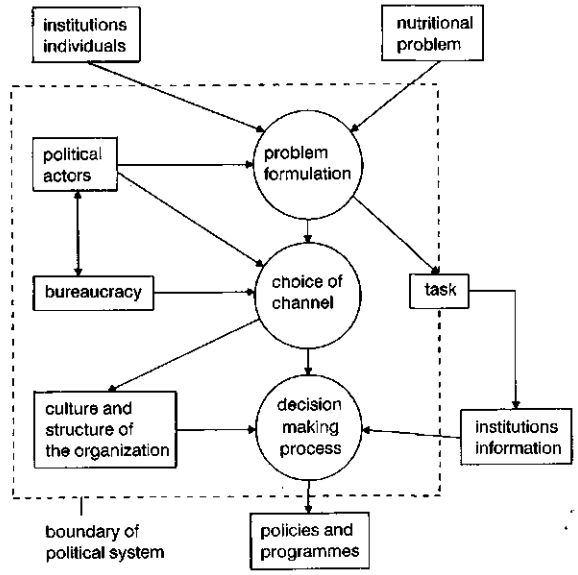

Fig. 2. Model of decision-making processes.

political factors while all actors will provide rational elements pertaining to the problem. This corresponds with the three decision models of Allison (1971) used to explain the Cuban missile crisis. Allison names these 'rational actor model', 'organizational process model' and 'government politics model'. He concludes that not one single model could explain entirely the Cuban crisis and that the three models complemented one another. Allison emphasizes the importance of political variables and states that a major key to the understanding of policy making, policy output and policy impact is information-based appreciation of intra- and interorganizational politics.

Most of the time decision-making processes are differentiated according to issues or problems. The problem, once it has been accepted as being a problem, is the task of the decision situation and affects the aspects of the environment to be considered (see Fig. 2).

In a decision situation three groups can be distinguished:
- political actors;
- civil servants;
- representatives of interest groups.

The representatives of these groups (may) have parochial perceptions of reality based on their organizational interest. For instance, in case a school feeding programme (a politically attractive and visible venture) is found to be ineffective it will be hard to convince all groups to cancel such a programme, since the suppliers of the food products and those (children and indirectly their parents) receiving the

products will have plenty of arguments to sustain the programme. For this situation nutrition information systems can provide a framework for cataloguing information on the particular issue, so that discussions are structured in a more rational way.

Cooperation and interaction with interest groups and consensus on major issues is essential for an effective nutrition policy. Otherwise, contradictory information will be presented to the consumer and consumers become confused and deceived about what a healthy diet looks like. Internal consistency will reduce the likelihood of consumer confusion and disillusion. This is one of the rationales for a close cooperation of the political system with industry, consumer organizations etc. Changing the perceptions of interest groups calls for an active involvement in the processes of decision-making, including such aspects as problem formulation and selection of alternatives. Those participants who share goals or a (cultural) background will agree more readily and faster on some common perception (or model) of the problem and decision situation. A centralized information system, in which all (essential) information is assumed to be shared, may have a positive effect on decision-making processes since participants are less able to withhold information for tactical or strategic reasons (Wierzbicki, 1983).

Policy process

A food and nutrition policy is the temporary outcome of ongoing policy-making processes. The integrated set of policies, programmes and projects relevant to the food system chosen to be implemented makes up the food and nutrition policy of a particular country. A policy is thereby made up of broad strategic statements of intent with respect to parts of the food system (for instance price policy). Programmes and projects can be seen as means of a particular policy, a project being a discrete effort that lasts only a few years. A programme consists of a number of related projects planned to be implemented simultaneously and/or sequentially to reach the objectives of a policy.

Policy formation is often viewed separately as an activity preceding substantial action. However this is a conceptual distinction used as an aid to analyse processes. A policy-making process can be seen as a sequence of various sub-processes, such as preparation, decision-making, implementation, evaluation and feedback (Hoogerwerf, 1978). While the sub-processes are distinct one from another, it must be emphasized that they are only distinct in that they represent identifiable activities. In practice, the sub-processes are rarely clear-cut, nor do they follow each other in an orderly sequence. There is often a considerable overlap between them and, depending on the problem in question, certain sub-processes may be skipped, bypassed or performed simultaneously (Mason & Mitroff, 1981). There is no such thing as an a priori step-wise progression from problem formulation to implementation and solution of the problem because this would imply a completely rational planning approach.

A policy process is as much a process of conflict resolution, or at least conflict deflection, as it is an exercise in rational decision-making (Field, 1977). Due to the political character of policy processes there is a need for process maintenance. A particular issue needs an organization to carry it through the decision-making

processes and must maintain support in the face of organized opposition (Edwards & Sharkansky, 1978).

Policy processes usually start with a crude indication whether or not to act, how to act, etc. Through bargaining and introduction of information the plans are becoming more and more concrete. This progressive deepening can be structured by means of the following instruments:

- problem formulation
- identification of the imposed constraints and explicit formulation of the chosen constraints
- identification of the variables that can be changed by the political system
- definition of the objectives
- identification of uncertainties
- formulation of the criteria, which define the objectives in a more operational way
- formulation of alternatives
- assess the effects or consequences that will be taken into account by the evaluation of the alternatives.

These instruments can potentially be used in a decision situation and all of them have both an analytical (structuring of the problem situation) and a political (the direction of the decision process) dimension.

Example of a policy process

With respect to fat intake in the Netherlands the decision situation has been (implicitly) structured, among other things, by the following aspects. Food consumption surveys have demonstrated that the average contribution of fat to energy intake is high in comparison with the guidelines (problem formulation). This nutritional problem has been given the highest priority since the effect on public health is considered to be greatest (problem formulation resulting in an objective). The Steering Committee for a Healthy Diet in which several industrial and governmental organizations participate (chosen alternative) has to take measures aimed at reducing fat intake of the Dutch population by 10 % within 4 years (criterion for result). One of the starting points of nutrition policy in the Netherlands is that each individual is free to select his/her own food (chosen constraint). Therefore, several alternatives, such as price policy and legislation, to realize the objective of reducing fat intake are excluded by choice. Furthermore, a choice was made to target programmes at the entire society, with those responsible for buying food products as the primary target group (chosen alternative). The Steering Committee mentioned has chosen to provide nutrition information in order to facilitate application of nutritional considerations to food consumption behaviour (identification of variable to be changed). However, the efficiency and effectiveness of implementation of nutrition education programmes is hampered by a limited knowledge of the determinants of and barriers to changing fat consumption (uncertainty). To reduce the uncertainty introduced by a lack of knowledge, evaluation studies play an essential role in guiding the steps to be taken in successive years. This implies that nutrition information systems should provide relevant data on the present

situation and on changes over time. Besides food consumption habits, such aspects as barriers for changing food selection, information sources of consumers and willingness of consumers to change should be studied, so that cost-effective strategies for nutrition education programmes can be identified and implemented. It should be realized that attempts to intervene in the behavioural pattern of a population that has cultural linkages to structural elements of that society, without an appropriate understanding of the underlying base, reduces the chance of success (Call & Levinson, 1973). The nation-wide programmes consist in information transfer through the mass media to obtain awareness of the problem and in provision of relevant information on fat content of foodstuffs and food preparation practices. The collaboration with the industry in the Steering Committee resulted in the support of groceries in that they supplied brochures and that posters were used to call for attention for the campaign. The principal variables chosen to be changed are food selection by raising awareness levels and improving knowledge and food supply through a four-year commitment of retailers and industry to expose consumers to messages advocating fat reduction (chosen alternative).

In principle, those involved in food and nutrition policy making are searching for the variables that have a positive effect on the nutritional status of the population. As a matter of course, changing these variables should be feasible: should be done can be done. The analyses should provide insight into the strength and stability of the causal relationships determining the state of the selected variables. Therefore, a broad range of variables (such as food sales, consumers' attitudes and knowledge and participation of retailers) are being studied in a coherent manner to provide the essential feedback information (van der Feen de Lille et al., 1991). In this way understanding of the effects of interventions is gained and theoretical models are developed, tested and adapted.

Information and analysis

Nutrition information systems should follow the results of the policy process in the sense that specific and timely information will be provided. These systems are mostly restricted to problem formulation and monitoring of changes. However, the scope of nutritional information systems can be much wider, such that more rational elements are introduced in decision-making processes. For instance, scenarios and simulation models are useful for the selection of potential alternatives. Simulation models come up with a quantitative assessment of changes in nutrient intake that may be expected when particular food products are substituted for other, more favourable foodstuffs. Scenarios assess, for instance, the potential impact of demographic developments on food consumption and can be used as a valuable reference projection against which the effects of intervention programmes have to be evaluated. Furthermore, these techniques provide quantitative information as to the question to what extent uncertainties depend on several assumptions that are necessary for the calculations. The rationale for using these techniques is the reduction of uncertainty. Uncertainty does not only result in analytical problems but may also lead to conflicts in a decision

situation. A high degree of uncertainty introduces a load of equivocal information into a decision situation which is the basis of speculations by the participants about the present and future (problem) situation. Uncertainties will increase the potential effect of power on the outcome of decision-making. In reality, power (organizational and/or political) is a substitute for knowledge in decision-making processes in which only marginal changes in the status quo will be considered due to the uncertainties. Information about the food system will promote knowledge and understanding of the problems, and thus of the decision situation. Information related to the decision situation has to be gathered and interpreted to reduce uncertainty with respect to the characteristics of the problem. Different actors will have different sets of incomplete information on which (personal) judgement of the circumstances are made. The interpretation of information and, consequently, formation of perceptions is usually in accordance with a conceptual framework that has been acquired from past experiences in the area concerned (Radford, 1980).

During a process of interaction, the various perceptions of the participants are mostly approaching one another as a result of information exchange. The interactions are not restricted to the exchange of clean data. The actors communicate not only about the problem, but also provide information about their intentions, objectives, power etc. Since information is an important power base in decision situations (Bacharach & Lawler, 1981), standardized, widely accepted nutrition information systems are of special importance. Furthermore, the results of nutritional information systems can reduce the impact of vested interests reflected in the power structure by giving a clear insight into the decision situation. The reason for this is that the impact of power on a decision-making process depends on the amount of uncertainty in a decision situation. A common perception of the problem increases the chance for generating an alternative that is generally accepted. The analysis remains scientific in method but its direction is guided by the political actors or their representatives (civil servants) who participate in a decision situation. As a matter of course, this distinction between politics and rationality is not clear-cut in reality. In order to stimulate this distinction an institutionalized network for surveillance should be realized such that tasks and responsibilities are clearly defined and visible. This will allow the political system to obtain the information needed and offer many opportunities to guide the production of relevant information.

In summary, the scope of nutrition information systems needs to be broader than the traditional aims of surveillance (description of dietary intake and nutritional status). The selection of issues to be studied depends to a great extent on the information needs of the decision-making processes responsible for food and nutrition policy.

References

Allison GT, 1971. Essence of decision: explaining the Cuban missile crisis. Little, Brown & Company, Boston.

Bacharach SB & Lawler EJ. Power and politics in organizations, 2nd ed. Jossey-Bass, San Francisco.
Call DL & Levinson FJ, 1973. A systematic approach to nutrition intervention programs. In: Berg A, Scrimshaw NS & Call DL (eds) Nutrition, national development and planning. MIT Press, Cambridge, 1973.
Edwards GC & Sharkansky I, 1978. The policy predicament-making and implementing public policy. Freeman, San Francisco.
van der Feen de Lille JCJF, Wedel M, Jonkers R, Pruyn JFA, Kistemaker C, van Aken AMMAM, Bouman M & Schneider P, 1989. Interim-rapportage evaluatie-onderzoek landelijke 'Let op Vet'-campagne. Report V91.272, TNO Nutrition and Food Research, Zeist, Netherlands.
Field JO, 1977. The soft underbelly of applied knowledge – conceptual and operational problems in nutrition planning. Food Policy 2: 228-239.
Hoogerwerf A, 1978. Het beleidsprocess. In: Hoogerwerf A (ed.), Overheidsbeleid, pp. 27-33. Samsom, Alphen aan de Rijn.
Kooiman J, 1982. Systeemdenken bij de analyse van overheidsdiensten. Systematica 2: 131-142.
Löwik MRH & Hermus RJJ, 1988. The Dutch Nutrition Surveillance System. Food Policy 13: 359-365.
Mason RD & Mitroff II, 1981. Challenging strategic planning assumptions. Wiley, New York.
Radford KJ, 1980. Strategic planning – An analytical approach. Reston Publishing Company, Reston.
Salter B & Tapper T, 1982. Policy making and the state apparatus. In: McGrew AG & Wilson MJ (eds.), Decision making: approaches and analysis, pp. 190-204. Manchester University Press, Manchester.
Schmid TL, Jeffery RW, Forster JC, Rooney B & McBride C, 1989. Public support for policy initiatives regulating high-fat food use in Minnesota. A multidisciplinary survey. Prev Med 18: 791-805.
Wierzbicki AP, 1983. Critical essay on the methodology of multi-objective analysis. Regional Sci Urban Econ 13: 5-29.

Nutrition information systems in Europe

W. Sekuła

National Food and Nutrition Institute, Warsaw, Poland

Introduction

Kelly & Becker (1991) have defined a nutrition information system as a decision support system for use in nutrition policy-making. According to their definition such a system works 'by observing, analysing and reporting regularly on a wide range of variables indicative of food consumption, nutritional status and health impact'. Various other definitions have been put forward all of which are fairly consistent as to basic concept.

Summarizing the opinion expressed by Kelly (1986), the fact that various data elements making up the nutrition information system are present in many European countries does not imply that they are being analysed in a fully integrated manner. The validity of this opinion cannot be denied as several countries have just started the preparations for establishing such a system.

Irrespective, however, of the extent to which nutrition information systems are operational, they all include the collection and utilization of the data which may be grouped into two broad segments, i.e. dietary data and health impact data. Some aspects of the former category are discussed in this paper.

The dietary data component of nutrition information systems

There seems to be no need to repeat in great detail what has been said before on the different methods of data collection used in and outside Europe. Similarly, the comprehensive description of particular features of the various types of dietary data is beyond the scope of this paper. Both aspects are covered extensively in the book recently issued by the WHO (1991) and in many other sources. It will suffice when I present only those dietary data which are most relevant to the subject of this paper.

The most commonly used sources of dietary data are undoubtedly food balance sheets, i.e. estimates of the national production and utilization of food. They show, among other things, the food supply available for human consumption. The basic reason of the popularity of data based on food balance sheets is that they are easily obtainable and that the user need not pay for them. Further, they seem to pose no problems with respect to utilization and interpretation.

The first attempts to prepare food balance sheets date back to World War I (Schulte et al., 1976). National food balance sheets, or at least supply data, are now being collected and published by the vast majority of European countries.

It is well known that the preparation and dissemination of food balance sheets for individual countries is a statutory task of the Food and Agriculture Organization of the United Nations (FAO). FAO has undertaken this activity since the end of the 1940s. The most recent FAO food balance sheets, published in 1991, covered 146 countries and included average supply and utilization of food over 1984–1986. Three-year averages for food supplies covering the period from 1961–1963 to 1986–1988 were also contained in this publication.

FAO is not the only international body engaged in producing and disseminating food balance sheets. The same activity is undertaken by the Organization for Economic Cooperation and Development (OECD) with respect to its member countries except Greece and Iceland. The OECD food balance sheets issued in 1987 covered the period 1976–1985 and included 23 developed market economies in Europe and beyond. (The latest edition, published in 1991, was not yet available when this paper was conceived.)

It follows than that European countries have at their disposal a real wealth of statistics which they may use for various purposes including nutritional ones. It will be demonstrated below, however, that this abundance of information may also give rise to some problems.

For further discussion it is important to note that both individual countries and the international organizations utilize the same general procedure in preparing food balance sheets. The special handbook issued by FAO in 1949 undoubtedly has contributed greatly to this uniformity. The procedure is based on the concept that the total quantity of foodstuffs produced in a given country in a particular year, added to the total quantity imported and adjusted for changes in stocks, gives the total available supply. Subtraction from this total of the quantities exported, fed to livestock, used for manufacture and lost during storage and transport yields the quantity available for human consumption. Per caput food supply is calculated by dividing the latter quantity by the total population. Data on per caput food supplies are both expressed in terms of quantity and converted into supply of energy and of selected nutrients (FAO, 1991). FAO and OECD present data for energy, fat and protein whereas individual countries vary in number of nutrients presented.

This subject can be concluded with the following observations.

- All elements of food balance sheets, except for food supply available for human consumption, may be determined independently with the aid of existing statistics or the estimates for production, export, import, manufacture, seed and food utilization, losses and the size of the population.
- In contrast to the above elements, food supply available for human consumption is calculated generally as residual. Its accuracy, therefore, is dependent directly on the accuracy of all other elements of food balance sheets.

Other important and more refined sources of dietary data are household surveys. Two types of such surveys can be distinguished, i.e. household budget surveys and the more specialized household food consumption surveys (van Staveren et al., 1991). In Europe surveys of the first type are conducted far more frequently than those of the second type. France, Italy, the Netherlands, Sweden and the UK are the only European

countries conducting household food consumption surveys. Of these countries, only the UK is conducting these surveys on an annual basis. Actually, in the UK these surveys have been conducted continuously since 1940 and Britain has the oldest tradition in surveys of this nature (Slater, 1991).

The predominance of household budget surveys is not surprising as they provide generally the data on food expenditure and, quite often, also on quantities purchased or obtained free.

In all countries, the introduction of household budget surveys has been inspired primarily by the need to have data on the standard of living of the various household types and, most of all, on their income and consumption patterns. The results of the surveys serve such economic purposes as revision of the weights for the consumer price index. The data obtained are used, among other things, for measuring poverty in specific population groups. The results of the surveys covering food expenditure and/or consumption are an important basis for a nutrition information system. Methodology, frequency and coverage of household budget surveys vary among European countries. Differences both in acquisition and in presentation of dietary data complicate comparison.

Table 1 shows the frequency of household budget surveys in selected countries and the sizes of the household samples. The samples are largest in Germany, Italy, Poland and France. In Germany and France, the sample size may be attributed to the low frequency of the surveys which are conducted once in every 5–6 years. In Italy and Poland budget surveys are repeated annually in spite of the large household samples. In the other countries, sample size varies between 2,000 and 10,000 households. In most of these, the interval between consecutive surveys is several years.

Using the results of the questionnaire developed during a workshop organized by the Department of Nutrition and Biochemistry, Athens School of Public Health, in

Table 1. Sample size and frequency of household budget surveys.

Country	Sample size	Frequency of surveys (years)
Belgium	3000	5
Denmark	3000	5
France	18000	6
Germany	50000	5
Greece	6000	6
Italy	36000	1
Netherlands	2000	1
Poland	30000	1
Portugal	10000	7
Spain	3200	¼
UK	8000	1

Source: Bielecki & Kubiczek (1991).

April 1990, Trichopoulou et al. collected and analysed the dietary data obtained in household budget surveys in 16 countries. Their findings covering 12 countries were presented during a workshop meeting on family budgets organized in Luxembourg in March 1992 (Trichopoulou et al., 1992). They found that, although large amounts of data are collected in almost all of these countries, the data are hard to compare. Trichopoulou et al. presented specific recommendations with respect to harmonization of the methods of collection and presentation of the results of surveys.

Neither supply data obtained from food balance sheets nor household food consumption figures measure actual intake. Information on actual intake can be obtained only through individual dietary surveys. As surveys of this type are time-consuming and expensive, the samples surveyed are usually small and rarely representative of the whole population, which reduces their usefulness (Buss, 1991).

Individual dietary surveys are mentioned here just to complete the listing of principal sources of dietary data. They will not be discussed in this paper as the principal focus is on data based on food balance sheets and household budget surveys. Some empirical findings on the particular features of these data and the relation between the latter types will be presented below.

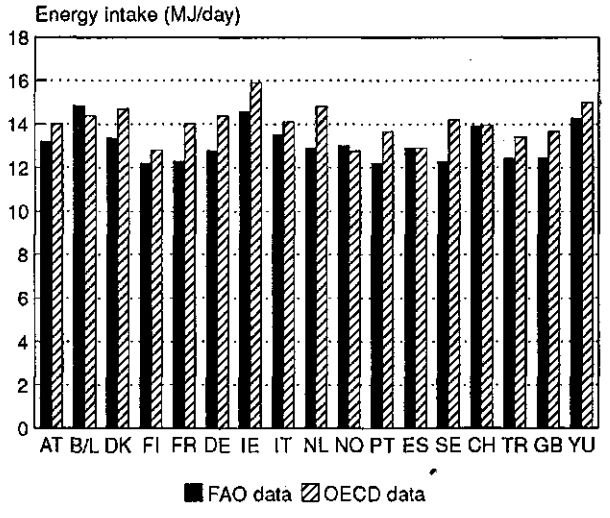

Fig. 1. Per caput supply of total energy according to FAO and OECD (averages 1982–1984). Country codes: AT, Austria; B/L, Belgium and Luxembourg; DK, Denmark; FI, Finland; FR, France; DE, Federal Republic of Germany ('West Germany', situation before the unification of Germany); IE, Republic of Ireland; IT, Italy; NL, Netherlands; NO, Norway; PT, Portugal; ES, Spain; SE, Sweden; CH, Switzerland; TR, Turkey; GB, United Kingdom; YU, Yugoslavia (situation before 1991/1992).

Some aspects of food supply data

Food supply data are often referred to as 'food consumption data' which may be correct from an economic point of view. Actually, food supply data measure just the potential availability for human consumption of various foodstuffs for the country as a whole and for each of its inhabitants.

Fig. 1 demonstrates the obvious features of these data. It shows the daily energy equivalent of per caput food supply in selected European countries as registered in the period 1982–1984. These data stem from recent FAO and OECD publications. Energy from alcohol is not included in these data.

The above features may be summarized as follows.

- First of all, as the energy equivalent of per caput food supply ranges between 12.5 and 14.5 MJ (3000–3500 kcal), it is impossible that it relates to actual intake. It can be denied on the basis of, for example, the results of the Dietary and Nutritional Survey of British Adults (Anon., 1990) which was carried out between October 1986 and August 1987 and covered a nationally representative sample of people aged 16 to 64. That survey showed average daily energy intake to be 10.3 MJ for men and 7.0 MJ for women.
- Balance sheets do not provide an indication of differences in food consumption patterns and the diets of the various population groups.
- It is not possible to reveal seasonal fluctuations in food supply, and hence in consumption, on the basis of these data.

Fig. 1 makes it possible to repeat the approach used and described before (Sekuła et al., 1991). It involves the comparison of FAO and OECD data on food supply and its energy and nutrient equivalents. The comparison is confined this time to energy and nutrients and covers a more recent period.

Only for two countries, Spain and Switzerland, the estimates for energy supply over 1982–1984 were similar in both data sources (FAO and OECD). For all other countries the differences were considerable. Except for Belgium/Luxembourg and Norway, the OECD estimates were higher than the FAO ones. For France, FRG, the Netherlands, Portugal, Sweden, Denmark and UK the difference was at least 10%.

Fig. 2 presents the figures on protein supply derived from the food supply data. The data sources were consistent only for Spain and Sweden. As for the energy data, the OECD source gave generally higher estimates than the FAO source, except for Austria and Norway. The OECD data were more than 15% higher for Denmark and Turkey, and 10% higher for Finland.

The discrepancies between both data sources were striking for the fat equivalent of the food supply (Fig. 3). The sources agreed only as to Switzerland. In Sweden, the amount of fat according to the OECD source was as much as 40% higher than according to the FAO files. For France this difference was 37%, and for FRG, the Netherlands and Portugal it was almost 30%.

Calculations based on the OECD source gave also higher figures for the contribution of fat to energy supply (Fig. 4). The exceptions for this comparison were Belgium/Luxembourg and Turkey.

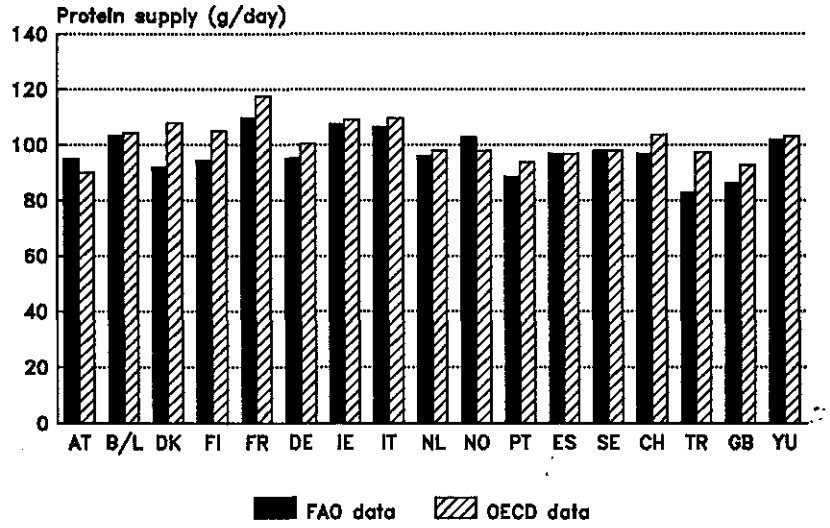

Fig. 2. Per caput supply of protein according to FAO and OECD data (averages 1982–1984). For country codes, see legend to Fig. 1.

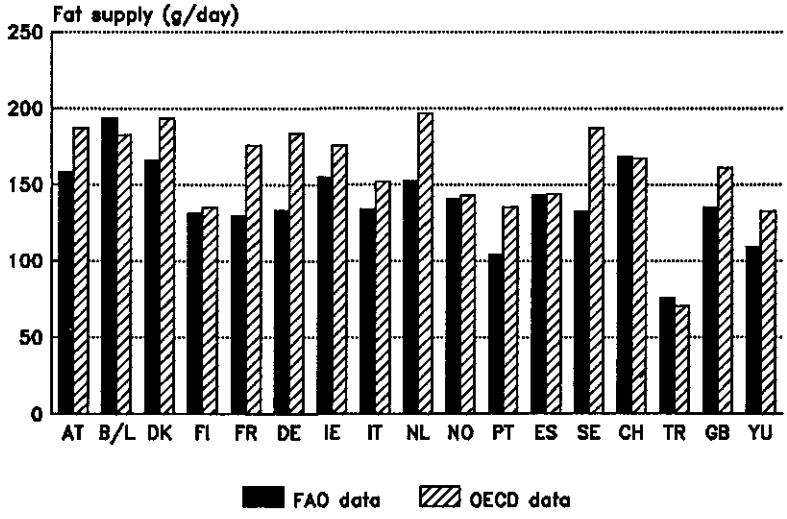

Fig. 3. Per caput supply of fat according to FAO and OECD data (averages 1982–1984). For country codes, see legend to Fig. 1.

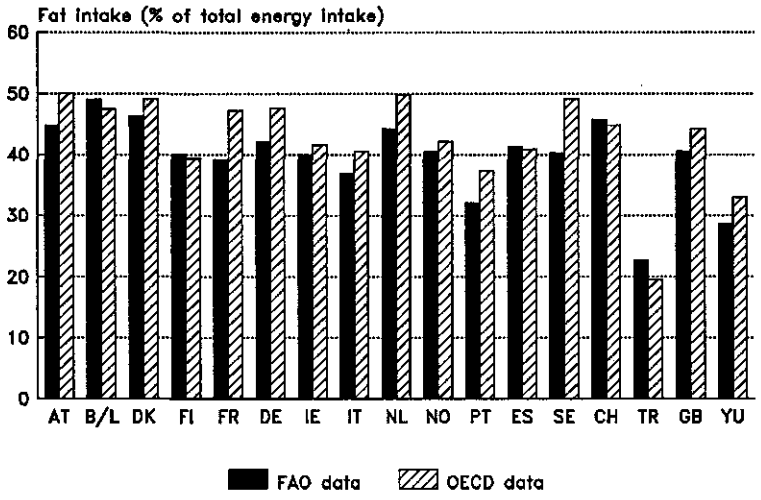

Fig. 4. Fat supply as a percentage of total energy supply according to FAO and OECD data (averages 1982–1984). For country codes, see legend to Fig. 1.

The size of the differences discussed seem to be unacceptable in the light of the fact that FAO and OECD follow in principle one and the same concept for calculating food supply data. In spite of the common basic concept for the preparation of food

Table 2. Estimates for daily per caput supply of selected nutrients in the UK in 1985 according to three different sources.

Nutrient	UK source	FAO*	OECD
Energy (MJ)	12.2	13.5	14.2
Protein (g)	86	88	95
Fat (g)	136	143	167
Fat (% of total energy)	41.5	40.1	44.3
Calcium (mg)	1120	839	n.d.
Retinol (mg)	1.3	0.6	n.d.
Beta-carotene (mg)	3.2	3.8	n.d.
Thiamin (mg)	2.1	1.5	n.d.
Vitamin C (mg)	114	114	n.d.

Source: Buss (1991).
* 1984–1986. n.d., not determined.

Table 3. Per caput supply of food groups (in g) according to FAO and Polish food balance sheets (averages 1986–1988).

Food group	FAO data	Polish data
Cereals	175.2	118.3
Sugars	47.9	44.5
Potatoes	107.1	141.0
Vegetables	116.3	115.0
Fruits	29.5	28.9
Meat	72.8	67.0
Fish	18.2	6.7
Eggs	11.3	10.2
Milk	241.2	273.7
Fats	32.7	25.0

Source: FAO food balance sheets and Polish Statistical Yearbooks.

balance sheets, similar differences are found between data provided by international organizations and those compiled by national agencies (Table 2). In 1985, the energy content of food supply in the UK according to the OECD source was more than 16% higher than that calculated by the British agency. The discrepancy for fat was even close to 23%.

These discrepancies are the result of both differences in food quantities included in the various sources and differences in nutrient conversion factors applied. The effect of differences in food quantities estimated is illustrated in Table 3 for Poland. Whereas the considerable lack in consistency for cereals and fish may be explained by the difference in basis for weight expression (FAO departs from primary weight, the Polish agency from processed weight), there is hardly such an explanation for meat and fats.

Another aspect of data on food supply that deserves attention is the lack of consensus among countries with respect to the quantities assumed to be used for human consumption and the energy and nutrient equivalents of foodstuffs. A comparison of various countries suggests that energy supply in the UK, Sweden, the Netherlands, the FRG, France and Finland, averaged over 1982–1984, was 12–17% lower than in Belgium/Luxembourg. Such a difference is very unlikely because of the lack of sizable differences between the former six countries and Belgium/Luxembourg with regard to economic performance and sex and age structure of their populations.

Relations between the dietary data derived from food balance sheets and those from household budget surveys

Poland may serve as a specific example in discussing this issue because of the fact that Poland is conducting country-wide household budget surveys on an annual basis

Table 4. Comparison of per caput annual food consumption data in Poland derived from food balance sheets (FBSs) and household budget surveys (HBSs), 1990.

Food group	FBS data	HBS data	HBS, % of FBS
Cereal products (kg)	115	96.2	84
Potatoes (kg)	148	116	79
Fruits including processed fruits (kg)	28.9	37.2	129
Vegetables incl. processed vegetables (kg)	119	69.9	59
Meat and offal (kg)	68.6	65.0	95
Fish and fish products	5.4	4.3	80
Fats and oils (kg)			
total	23.6	20.3	86
vegetable fats and oils	7.6	5.9	78
butter	7.8	8.8	113
Milk and milk products, in liquid milk equivalents (litres)	241	242	100
Hen's eggs (*n*)	190	204	107
Sugar (kg)	44.1	32.0	73

Source: compiled from Polish Statistical Yearbook and from results of the HBSs.

and that both food expenditure and food quantities are recorded. This makes it possible to compare the figures emerging from both data sources. Before entering into such a comparison the features of household budget survey (HBS) data deserve some attention.

HBS data refer to quantities that 'enter' the household and are expressed in 'as purchased' weight. Generally, like in other countries, quantities consumed outdoors are not taken into consideration. Consequently, HBS dietary data should be lower than food balance sheet (FBS) data.

Table 4 summarizes data on per caput food quantities derived from Polish FBS and HBS data covering 1990. To allow for a proper comparison, the more detailed HBS data were aggregated into the food groups making up the FBSs. For most food groups FBSs gave higher figures than HBSs. The extent of the differences varied widely and was largest for vegetables and animal fat. Contrary to assumptions, the HBSs gave higher figures for fruits, butter and hen's eggs than FBSs. For fruits and hen's eggs this may be explained by the fact that Polish official statistics do not cover non-commercial production.

However a different explanation must be given for the higher butter figures in the HBSs. Dramatic increases of retail prices in 1990 prompted farmers to produce their own butter. Besides, market-oriented reform introduced in Poland resulted, among other things, in liberalization of foreign trade activities. Imported commodities, including butter, purchased by a great many of private entrepreneurs, entered the Polish food market but were not always reflected in official statistics.

Table 5. Comparison of energy and nutrient intake in Poland derived from food balance sheet (FBS) and household budget survey (HBS) data, 1990.

Nutrient/energy	FBS data	HBS data	HBS as % of FBS
Energy (MJ)	14.1	11.0	78
Protein (g)			
total	88.4	72.0	81
animal protein	52.0	44.2	85
vegetable protein	36.4	27.8	76
Fat (g)	122.3	107.5	88
Carbohydrates (g)	472	342	72
Calcium (mg)	1072	679	63
Iron (mg)	17.0	13.9	82
Magnesium (mg)	341	227	67
Thiamin (mg)	2.09	1.40	67
Riboflavin (mg)	2.12	1.50	71
Vitamin C (mg)	110.7	84.7	77

Source: calculations of the Department of Food Economics, National Food and Nutrition Institute.

Table 6. Comparison of food balance sheet (FBS) and household budget survey (HBS) data with regard to the relative contribution (%) of protein, fat and carbohydrates to total energy supply, Poland, 1990.

Macronutrient	FBS data	HBS data
Protein	10.6	11.0
Fat	32.9	36.9
Carbohydrates	56.5	52.1
Total	100.0	100.0

Source: calculations of the Department of Food Economics, National Food and Nutrition Institute.

Table 5 elaborates on the comparison between FBS and HBS data. For both energy and all of the nutrients contained in this comparison, FBSs gave the highest figures. However the size of the difference in value between FBS and HBS data varied from nutrient to nutrient. Consequently, there were also differences between the two data sources for the contribution of protein, fat and carbohydrates to total energy supply (Table 6), HBS data giving a higher figure for the relative contribution of fat.

Summary and conclusions

Dietary data required for nutrition information systems are derived from different sources including food balance sheets (FBSs), household surveys and individual dietary surveys. Among these, data on food supply available for human consumption contained in FBSs are most easily obtainable and hence most commonly used. Data of this type are produced and disseminated by the vast majority of European countries. International organizations are also involved in regular activities pertaining to data collection and presentation.

A comparison of data from different sources, including those published by FAO and OECD as well as some national sources, showed that there are considerable differences among the various sources with respect to both food quantities and supply of energy and nutrients. This fact is alarming in the light of the fact that methods of data collection are based on one and the same basic concept. Serious efforts aimed at harmonization of data are urgently called for.

Similar efforts should be spent on improving the accuracy and reliability of FBS data. A simple comparison like that presented in this paper reveals considerable inconsistencies in data presented. Cross-checking with other dietary data sources, such as household surveys, will help identify inaccuracies and ways to correct these.

FAO's recent call for 'Further intensification of dialogues with FAO on the harmonization of FAO data series on food and agriculture with the statistical records of member countries' (FAO) 1991 deserves to meet with appropriate response.

References

Anonymous, 1990. The dietary and nutritional survey of British adults. A survey of the dietary behaviour, nutritional status and blood pressure of adults aged 16 to 64 living in Great Britain. Crown copyright.

Bielecki J & Kubiczek A, 1991. Badanie budżetów gospodarstw domowych w krajach EWG i w Polsce. Wiadomości Statystyczne 6.

Buss DH, 1991. Food patterns in the British Isles. Ann Nutr Metab 35 (Suppl.1).

FAO, 1949. Handbook for the preparation of food balance sheets. Food and Agriculture Organization of the United Nations, Washington.

FAO, 1991. Food Balance Sheets, 1984–1986 average. Food and Agriculture Organization of the United Nations, Rome.

Kelly A (Ed.), 1986. Nutritional surveillance in Europe: a critical appraisal. Report of an EC Workshop, Athens, Greece, 22–23 May 1986.

Kelly A & Becker W, 1991. Nutrition information systems and data quality requirements. In: Food and health data: their use in nutrition policy-making. WHO Regional Publications, European Series No 34. World Health Organization, Regional Office for Europe, Copenhagen.

OECD, 1988. Food consumption statistics 1976–1985. Organization for Economic Cooperation and Development, Paris.

Schulte W, Becker K & Naiken L, 1976. Food consumption: food balance sheets, food

supplies. In: International encyclopedia of food and nutrition, Vol. 5: Food consumption and planning. Pergamon Press.
Sekuła W, Becker W, Trichopoulou A & Zajkas G, 1991. Comparison of dietary data from different sources: some examples. In: Food and health data: their use in nutrition policy-making. WHO Regional Publications, European Series No 34. World Health Organization, Regional Office for Europe, Copenhagen.
Slater JM (Ed.), 1991. Fifty years of the National Food Survey, 1940–1990. Proceedings of a symposium held in December 1990. Ministry of Agriculture, Fisheries and Food, London.
van Staveren WA, van Beem I & Helsing E, 1991. Household budget surveys. In: Food and health data: their use in nutrition policy-making. WHO Regional Publications, European Series No 34. World Health Organization, Regional Office for Europe, Copenhagen.
Trichopoulou A, Lagiou A, Valaora A & Vassilakou T, 1992. Improvement and harmonization of food data in household budget surveys in countries of the European Community. Proposal to the Statistical Office of the European Community (January 1992).
WHO, 1991. Food and health data. Their use in nutrition policy-making. WHO Regional Publications, European Series No 34. World Health Organization, Regional Office for Europe, Copenhagen.

Nutritional surveillance: an outline

A. Ferro-Luzzi[1] and C. Leclercq[2]

[1] *National Institute of Nutrition, Rome, Italy;* [2] *WHO Collaborating Centre for Nutrition*

In many developed countries profound changes in dietary practices of the population have occurred over the years of economic development and improved food supply. These changes have driven undesirable qualitative modifications in the diet. Thus, while food-borne diseases and deficiency states have become negligible, a distortion of the nutrient profile of the diet has become apparent, with nutrient excesses and imbalances that typify the 'Western' or 'affluent' diet. There is now mounting epidemiological evidence that the increase of many chronic non-communicable diseases is causally linked to these dietary changes.

The evidence relating chronic diseases to diet is still object of some controversy (Skrabanek et al., 1992), but many authoritative bodies have considered it sufficiently strong to issue dietary guidelines for the prevention of chronic diseases, such as the Surgeon General (Anon., 1988), the National Research Council (Anon., 1989), the National Advisory Committee for Nutrition Education (Anon., 1983), the Committee on Medical Aspects of Food Policy (Anon., 1984), the World Health Organization (WHO Study Group, 1990), the National Cancer Institute (Anon., 1987). The governments of several developed countries have integrated explicit nutritional considerations in their food production policies. In this approach, a food and nutrition policy is expected not only to guarantee food security at the household level, but also to prevent the appearance of chronic food-related diseases.

To be successful, these policies require a multisectorial, integrated approach and, to be sustainable, need have a contained cost. An important facet of a food and nutrition policy is the implementation of an efficient nutritional surveillance system. Nutritional surveillance consists in the systematic collection and analysis of data describing and predicting temporal trends in diet-mediated nutritional disorders of public health relevance. To this end, it is essential to maintain a close watch on the evolution of nutritional problems and of dietary risk, to monitor the availability of priorities, and to provide the indispensable basis for setting, when appropriate, corrective and preventive measures.

There is no ready formula for developing a convincing model of nutritional surveillance, and it is acknowledged that 'any surveillance scheme needs to be tailor-made to the country in which it is operating' (Eylenbosch and Noah, 1988, p. 15). Therefore, when depeloping a nutrition surveillance system, a stepwise decisional process is required to establish a priority list of which dietary risk factors to monitor, what information to collect, the justification (both in a scientific sense and in terms of cost/benifit analysis) of why and when to implement the system, its targets, and the

Table 1. The steps required for developing a convincing model of nutritional surveillance.

1. Assess dimensions of health problems
2. Choose priority areas (costs, avoidability)
3. Formulate a working hypothesis
4. Identify groups at risk
5. Select indicators and cut-off points
6. Set action-triggering levels and sentinel groups
7. Establish medium- and long-term goals
8. Identify data-collecting centres
9. Activate the flow of secondary information
– secondary data (identify data-collecting centres)
– primary data (design ad hoc surveys)

expected realistic outcomes (Table 1). (For a more detailed description, see Ferro-Luzzi & Leclercq, 1991; Ferro-Luzzi et al., 1993; Mason et al., 1987; Milio, 1990.)

The 'hardware' of a surveillance system consists of (a) a network of data collecting centres, (b) a system of channels bidirectionally linking the peripheral network and a centralized intelligence, and (c) a system programme for converting the incoming information into relevant outgoing messages. The whole system needs to be tightly linked with all the relevant government sectors, preferably acting intersectorially to respond with appropriate authority.

The design of such a system is far from simple, especially when financial considerations and the containment of the costs require that maximum use be made of secondary data. Secondary data are relevant informations collected for other purposes by other bodies. The utilization of documentation of this nature requires access to the data bank in order to assess the quality and representativity of the information, and for their incorporation under suitable form in the global surveillance system. It is unlikely, however, that exclusive recourse to secondary data will provide sufficient and satisfactory documentation for a nutrition surveillance system. There will be always the need for collection of some primary data. For either option, however, it is important that the system has clearly specified realistic targets, a rational approach to achieve them, and a cost-benefit analysis.

Table 1 enumerates the decisional steps required to set up a surveillance system. The nine steps enumerated in Table 1 need not take place in a sequential way, but rather concurrently, along a multiple feed-back circuit with repeated re-allignments.

One of the first critical steps required to set up a nutritional surveillance system is represented by the choice of which diet-related pathologies to focus on. The list of diseases and disorders that have been linked to the diet is quite long, ranging from conditions with a well recognized dietary risk factor and quantified preventability to conditions for which the understanding of the nutritional link is still tentative and incomplete (Ferro-Luzzi & Leclercq, 1991). The choice of which diseases to monitor is operated through a multistage process, which starts by establishing the nature and

the dimensions of the nutritionally related health problems in the community for which the surveillance system is being developed and the identification of potential high-risk groups in the population. For example, in Europe, the public health problems are described quite convincingly by mortality statistics. Heart diseases, tumours, cerebrovascular diseases and hypertension are the leading causes of death, albeit the ranking order varies among countries. Together these diseases account for 65% and more of total mortality (Milio, 1990). But there are also other conditions which do not appear in the mortality statistics but which may also represent major causes of public health expenditure, either because of their immediate impact (eg. dental caries) or because they are a recognized risk factor (e.g. obesity).

The decision of which condition to include in a nutritional surveillance should be ideally based on economic considerations (cost of diseases, cost of prevention), on the actual and realistic expectation of abatement of the rate or prevention of the occurrence of a specified event (the logistics of the operation; pre-primary versus primary prevention; dietary or life-style changes versus theurapeutic treatment, etc.), and on the feasibility of introducing the desired changes in dietary habits. The direct and indirect costs of diseases, while endowed of a powerful advocacy value vis-a-vis policy makers, are hard to calculate because of the scarcity of available data. A crude but useful proxy may be represented by the annual costs involved in hospitalization for chronic dietary-related non-comunicable diseases.

A clearly spelled working hypothesis of the likely causal relationships between dietary exposure and health outcome represents the next important step and provides the best guidance for developing suitable indicators. It also represents the prerequisite for the formulation of realistic cut-off points for action, the setting of early-warning thresholds, the adoption of medium- and long-term goals and the stipulation of the desired outcomes.

The choice of indicators is necessarily tied to the nature of the surveillance system, whether based on specifically collected data or on secondary data. Surveillance indicators may be grouped into four classes as shown in Table 2: 'outcome indicators' (such as mortality and morbidity statistics), 'impact indicators' highlighting pre-clinical conditions (such as hypercholesterolaemia, hypertension and hyperglycaemia), 'causal indicators' (all the relevant dietary risk factors) and 'predictive indicators' (a heterogeneous group of environmental determinants of the exposure to dietary risk, such as food prices, consumer's knowledge and attitude).

Each of these indicators need to be assigned appropriate cut-off points for triggering interventions, and sentinel conditions. The setting of these values may be subject to periodic revision as the tolerance of a community towards existing public health problems may vary with time and depends on the public awareness and the financial situation.

Before activating the system a Centre must be created which is capable of receiving sustained incoming information, of processing the information in real time, and of producing an output consisting of intelligible and concrete messages. Finally, suitable receptors for the outcoming messages of the system should be conceived whereby government actions are primed off when appropriate.

Table 2. Categories of indicators for nutritional surveillance.

Categories	Examples
Outcome indicators	Mortality statistics Morbidity statistics Other vital statistics, e.g. caries
Impact indicators	Blood pressure Blood cholesterol level Body mass index Bone density Glucose tolerance, etc.
Exposure (or causal) indicators	Food Nutrients Non-nutrients Food-processing methods, etc.
Predictive indicators	Food prices Animal husbandry practices Consumer's knowledge and attitude Trends in food consumption,mortality,etc.

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References

Anonymous, 1983. A discussion paper on proposals for nutrition guidelines for health education in Britain. National Advisory Committee for Nutrition Education, Health Education Council.

Anonymous, 1984. Diet and cardiovascular disease. Committee on Medical Aspects of Food Policy (COMA). HMSO, London.

Anonymous, 1987. Diet, nutrition, and cancer prevention: a guide to food choices. National Cancer Institute, National Institutes of Health. US Government Printing Office, Washington DC.

Anonymous, 1988. The Surgeon General's report on nutrition and health. US Department of Health and Human Services, Public Health Service. US Government Printing Office, Washington DC.

Anonymous, 1989. Diet and health: implications for reducing chronic disease risk. National Research Council. National Academy Press, Washington DC.

Eylenbosch WJ & Noah ND (Eds.), 1988. Surveillance in health and disease. Commission of the European Communities. Oxford University Press, Oxford.
Ferro-Luzzi A & Leclercq C, 1991. The decision making process in a nutrition surveillance in Europe. Proc Nutr Soc 50: 661-672.
Ferro-Luzzi A, Leclercq C & Berardi D, 1993. Sistema Informativo Nutrizionale. Relazione Scientifica al Ministerio della Sanità. Quad Nutr (inpress).
Mason JB, Habicht JP, Tabatabai H & Valverde V, 1987. La surveillance nutritionnelle. WHO, Geneva.
Milio N, 1990. Nutrition policy for food-rich countries. A strategic analysis. John Hopkins University Press.
Skrabanek P, Gibney M & Le Fanu J, 1992. Who needs WHO? Three views on the World Health Organization's dietary guidelines. Social Affairs Unit, Research Report 16.
WHO Study Group, 1990. Diet, nutrition, and the prevention of chronic disease. Technical Report Series 797. WHO, Geneva.

Nutritional surveillance: a plea for European coordination

Leonore Kohlmeier

University of North Carolina, Chapel Hill, NC 27599-7400, USA

Abstract

Nutritional surveillance is an activity that implies an active component of data collection and regular data analyses. Without evaluation and reporting, however in a regular and usable form, the surveillance cannot serve its purpose as a guiding resource for decision-makers. Neither at the national level nor at the European level is nutritional surveillance ongoing in Europe. This essential component of a well designed national nutrition policy is needed for current assessments, early warnings, prediction of future trends and programme evaluation.

A proposal for the contents and design of a minimal national nutrition surveillance has been developed. It includes the evaluation of information on life expectancy, mortality from nutrition-related diseases, morbidity from such diseases and sampling and assessment of risk factor profiles, as predictors of trends and future morbidity. This health information is one aspect of surveillance, which should be complemented with evaluation of the consumption behaviour of both the population at large and of vulnerable groups. Also, knowledge of and attitudes towards food and nutrition belong in a surveillance programme.

Surveillance cannot survive and develop without the delegation of a responsible and independent body closely tied to the decision-makers which has the responsibility and resources to produce frequent reports on the nutritional status of the nation. The nature of that body, and the contents and style of its reports, will be discussed as well as the usefulness and potential for developing a common core protocol for nutritional surveillance in Europe.

Introduction

Nutrition policies need a foundation of up-to-date facts on the nutritional status of the population and on the extent and importance of food-related diseases, both for the population at large and for vulnerable groups within that population. Policies must also be based on information about consumption patterns, nutritional knowledge and other factors influencing availability and choice. In addition, policy-makers require accurate and current evaluations of the effectiveness of ongoing programmes. This need for information has long been recognized (Mason, 1984) and nutritional

surveillance built into models of national nutritional policy as designed by the WHO has been advocated (Helsing, 1991). The aims of national nutritional surveillance systems in all European countries should be:

- to describe the current nutrition-related health, disease and risk status of the population,
- to provide information that will contribute to the analyses of causes and factors associated with risk,
- to use up-to-date information to assess acute needs and to determine what preventive measures would be appropriate,
- to serve as an early warning system to detect unexpected changes in morbidity or risk factor status in the population,
- to provide the information needed to enable predictions as to the probable developments in health status and disease incidence,
- to monitor and evaluate the effectiveness of programmes designed to curb disease incidence and to reduce the proportion of the population at risk.

The needs of decision-makers are currently not being met. No European country has a regular system monitoring dietary intakes, nutritional status and food-related diseases at the national level. Up-to-date information is not being collected regularly, with a few exceptions, and annual surveillance reports are not being produced. Only the United Kingdom is conducting national dietary surveys and has started national health surveillance.

Most countries depend on household budget surveys (Trichopoulou, 1992; Lagiou, 1992) conducted irregularly and aimed at estimating personal expenditures; irregular surveys or regional studies in specific age groups not focusing on nutritional adequacy offer meagre information on dietary practices or nutritional risks.

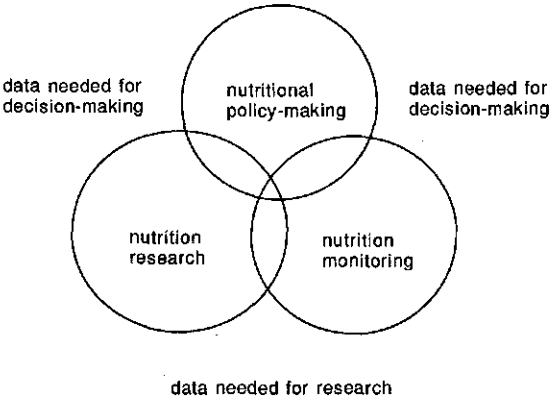

Fig. 1. Relations among nutrition policy-making, nutrition research and nutrition monitoring. (Adapted from the US Department of Health and Human Services and US Department of Agriculture ten-year comprehensive plan for the National Nutrition Monitoring and Related Research Program 1992.)

In the USA, national nutritional monitoring has recently been mandated in the National Nutrition Monitoring and Related Research Act which was passed in 1990. Participants in these activities are the departments of Health and Human Services, Agriculture, Commerce, Education, Veterans Affairs, Defense and Labor, the Environmental Protection Agency and the Agency for International Development. As can be seen in Fig. 1, in the ten-year comprehensive plan developed in 1992 by the departments of Health and Human Services and Agriculture, policy-making, monitoring and research go hand in hand (Anon., 1992).

An inter-agency board directs the developments and oversees a ten-year plan which should ensure that the 22 federal agencies involved collect timely and reliable data continuously, coordinate data collection, use comparable methods and conduct research relevant to nutritional monitoring of the population and vulnerable subgroups. These are admirable goals, which still remain to be accomplished. These goals are just as important in Europe both at the national and the European Community level.

Need for information

Nutritional surveillance requires regular assessment of the dietary behaviour of a population, conversion of this information into a nutritional picture and making this picture introspective in the context of the health of the population. To provide guidance on the contents of a complete, well rounded, minimal nutritional surveillance, the IUNS Committee on Nutritional Surveillance has published guidelines for a nutritional surveillance system (Kohlmeier, 1990). The Committee recommends that nine sets of information be regularly assessed and analysed. The information basis for nutritional surveillance programmes is listed below.

1. Examination of the life expectancy of men and women at birth and after one year of life: how has it changed over time and how does it compare with neighbouring countries?
2. Knowledge of the major causes of premature death in the population: how does this picture change over time, which of the diseases are potentially nutrition-related, and which age-sex groups are most strongly affected?
3. Knowledge of the extent (in terms of prevalence and incidence) of nutrition-related diseases such as diabetes mellitus, obesity, dental caries, osteoporosis, food-borne toxin-related infections, nutrition-related anaemia, goitre, cardiovascular disease, cerebrovascular disease, stomach cancer, colon cancer, gall stones and diverticulosis.
4. Knowledge of the extent of nutrition-related disease risk factors (potentiators) such as the prevalence of pathological lipid and lipoprotein levels, overweight and obese sections of the population, hypertensives, as well as knowledge of the vitamin, mineral and trace element stores in the population and how these have developed over time.
5. Knowledge of the consumption behaviour of the population in terms of what foods are eaten primarily, in which amounts consumed, storage and preparation practices and changes over time are important.

6. Knowledge of nutrient intake and nutrient sources in the population is an essential component of nutritional surveillance. This includes the distribution of intake, the determination of the probability of deficiency and the proportion of the population that may be deficient, an overview of the use of supplements and familiarity with the availability of food composition information on commonly consumed foods and dishes.
7. The knowledge level of the population regarding food and nutrition and their relation to health. The educational level of the teachers and medical personnel in particular as well as that of the population in general is important.
8. An overview of the recommendations regarding dietary intake being transmitted within the country as well as the messages being distributed by the media (both contents and frequency) and by the professional community belong in a nutritional surveillance programme.
9. An inventory of nutritional programmes, other programmes involving nutritional advice propagated by the government. The advice and activities in the field of nutrition carried out by volunteers' groups and an overview of all the groups that could play a role in disseminating general nutrition information is relevant. This includes health departments, health insurances, education departments, disease-related associations, diet and dieting groups, nutritional societies, special interest groups (e.g. vegetarians) and environmental protection groups.

Although much of the information required is available, it is not routinely used and evaluated for these purposes. Morbidity is not assessed objectively in most countries.

A number of European countries have experience with national health interview surveys, other countries are exploring the possibilities for setting up nationally representative surveys. Up to now incomplete overviews show that at least 12 countries in the European region have conducted national health interview surveys (or multi-purpose surveys with health and health-related topics as a significant component) since 1980 (Anon., 1988). These surveys, however, have largely been conducted by mail and include neither a physical examination component nor nutritional assessment. A synopsis on these health interview surveys has been published (Spuler & Paccaud, 1988).

An up-to-date overview of the components of nutritional surveillance relating to food consumption and risk status measured at the national level in Europe has been compiled by Anna Ferro-Luzzi (Istituto Nazionale della Nutrizione, Rome). The results from various countries responding to a questionnaire she sent to European experts are listed in Table 1. They indicate that, apart from individual research projects, few regular or long-term activities are taking place. Nutrition-related cancers are addressed in 60% of the countries responding. Hypertension, hyperlipidaemia and dental caries are parameters of interest in 40% of these national surveys. Other diseases, such as goitre, diabetes and osteoporosis, are measured in only two of the countries responding.

The equally important issue of the nutritional status of vulnerable population groups and groups that are hard to sample is receiving little attention at the national level in Europe at this time. On the contrary, many national surveys include only individuals

Table 1. Assessment of morbidity rates and nutritional status from nutrition-related diseases at the national level in Europe.[1] (Adapted from Ferro-Luzzi.)

Parameter	DK	FR	GB	GE	GR	HU	NL	NO	PT	TR
Cancer	+	–	+	+	+	+?	+	+	–	–
Cardiovascular incidents	+	–	–	+	–	–	+	–	–	–
Hypertension	+	–	+	+	–	–	+	–	–	–
Hip fracture, osteoporosis	+	–	+	–	–	–	–	–	–	–
Dental caries	+	–	+	–	–	–	+	+	–	–
Anaemia	+	–	+	+	–	–	–	–	–	–
Goitre	+	–	–	+	–	–	–	–	–	–
Diabetes	+	–	–	+	–	–	–	–	–	–
Liver cirrhosis	+	–	–	+	–	–	–	+	–	–
Overweight/obesity	–	–	+	+	–	+	+	–	–	–
Lipid levels	–	–	+	+	–	+	+	+	–	–
Vitamin status	–	–	+	–	–	+	+	–	–	–
Mineral status	–	–	+	+	–	+	–	–	–	–
Growth retardation	+	–	+	–	–	+	–	–	–	–

[1] +, included in national survey; –, not included in national survey; DK, Denmark; FR, France; GB, United Kingdom; GE, Germany; GR, Greece; HU, Hungary; NL, Netherlands; NO, Norway; PT, Portugal; TR, Turkey.

who speak the language, or hold citizenship, and are available over household samples, excluding resident non-nationals and migrants, those institutionalized (homes, hospitals, prisons) or those in poor health.

European coordination

There are indications that the interest in health surveys is increasing at the national level in many countries, and the danger exists that the results of these efforts will remain incomparable unless research on the design and composition of national European health surveys is conducted, modules for internationally comparable surveys are developed and the resulting concept is tested across Europe for cost, feasibility and validity.

A common European health policy will require baseline information derived from comparable data sets on the health status of various age-sex groups of the population. The international comparability of national and regional health surveys is currently not assured. Research is still needed in this field before a database supporting future European health policy can be developed.

The goal of a European health and nutrition survey would be to establish a standardized and thus internationally comparable health information system that serves the purpose of monitoring developments in health and morbidity in Europe. Central to this

would be the development of comparable survey designs, measurements, dietary assessment tools, food coding systems and food and nutrient databases. Some advances have been made with the support of the European Commission, which would allow intake comparisons. One of these is the development of a European food coding system, the Eurocode (Kohlmeier, 1992). Others are needed to develop a comparable survey core. A starting point for developing specific recommendations could be the core indicators of nutritional status outlined by the expert panel of the Life Sciences Research Office (Anderson, 1990).

A responsible permanent body

Nutrition policy must be built upon a foundation of solid, up-to-date knowledge on the nutritional status and nutrition-related diseases of the population at large and of vulnerable groups. Policy decisions also require knowledge on consumption patterns and knowledge levels. Finally, the efficacy of existing programmes requires regular evaluations.

Information alone will not guarantee the achievement of the aims of surveillance. Along with the surveys, surveillance units are needed, whose responsibility it is to analyse the results and to report in a coherent and rapid form to decision-makers on the findings of the survey.

The IUNS Committee on Nutritional Surveillance recommends strongly that a body be installed to collect, evaluate and report on the current 'nutritional status' of the population. These surveillance units should be directly responsible to the government and be established with a permanence which will allow for continuity in monitoring.

It is advisable to set aside the resources needed for a permanent unit whose purpose it is to collate the information required for nutritional surveillance in a standardized way and report regularly to the government on the status of the nation. Furthermore, the unit can provide information on request to the ministries involved in agriculture, consumer affairs, public health and environmental protection. This information should be used for planning, evaluation and setting priorities.

Looking to the future, there is a need now for nutritional surveillance across Europe to serve as an early warning system for change, a need to allow comparable health assessment across Europe for the development of common health policies. Efforts to coordinate this important task such that comparability of results will be guaranteed would be well invested. After two European regional meetings on nutrition policy, the time has come for national initiatives to develop, and there are signs that these have started indeed. An opportunity will be lost if these new surveillance efforts are not developed in a coordinated fashion across Europe.

References

Anderson SA (Ed.), 1983. Core indicators of nutritional state for difficult-to-sample populations. J Nutr 120: 1559-1600.

Anonymous, 1988. Introduction. In: Consultation to develop common methods and instruments for health interview surveys, pp. 5-6. World Health Organization Regional Office for Europe / Netherlands Central Bureau for Statistics, Department of Health Statistics.

Anonymous, 1992. Ten-year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program. US Department of Health and Human Services / US Department of Agriculture.

Helsing E, 1991. Use of a nutrition information system. In: Food and health data: their use in nutrition policy-making. World Health Organization, Regional Office for Europe, Copenhagen.

Kohlmeier L (coordinator), 1992. The Eurocode 2 food coding system. Eur J Clin Nutr 46 (Suppl. 5): S25-S34.

Kohlmeier L, Helsing E, Kelly A, Moreiras-Varela O, Trichopoulou A, Wotecki CE, Buss DH, Callmer E, Hermus RJJ & Sznajd J, 1990. Nutritional surveillance as the backbone of national nutrition policy: recommendations of the IUNS Committee on nutritional surveillance and programme evaluation in developed countries. Eur J Clin Nutr 44: 771-781.

Lagiou A, Valaora A, Vassilakou T & Trichopoulou A, 1992. Comparability of food availability data in household budget surveys in European Community countries. Eur J. Clin Nutr 45 (Suppl. 5): S35-S136.

Mason GB, Habicht J-B, Tabatabai H & Velverde V, 1984. Nutritional surveillance. World Health Organization, Geneva.

Spuler Th & Paccaud F, 1988. Overview of health interview surveys: the experience of the United States, Great Britain, the Netherlands, Italy and Switzerland. In: Consultation to develop common methods and instruments for health interview surveys, pp. 71-74. World Health Organization Regional Office for Europe / Netherlands Central Bureau for Statistics, Department of Health Statistics.

Trichopoulou A, 1992. Monitoring food intake in Europe: a food data bank based on household budget surveys. Eur J Clin Nutr 46 (Suppl. 5): S3-S8.

Contribution of technological developments to nutritionally adequate food supply

Use of artificial sweeteners and fat substitutes and their effects on food consumption

J.E. Blundell

BioPsychology Group, Psychology Department, University of Leeds, Leeds, LS2 9JT, UK

Introduction

Artificial (high-intensity) sweeteners and fat substitutes represent increasingly important modification of the food supply in technologically advanced societies in Europe and North America. One of the main reasons underlying the development of these products is the intention to provide an increasingly wider choice of foods which could provide an opportunity for people to moderate their energy intake and therefore to control body weight. The prevention of obesity is now a major goal of health authorities in many parts of the world. To assess the impact of artificial sweeteners and fat substitutes on the energy intake of consumers it is necessary to consider the relationship between appetite and overweight.

Overconsumption – how does it happen?

In the UK overweight or obesity characterise 45% of men and 36% of women (OPCS, 1990). Moreover, comparing surveys published in 1982 and 1988, it appears that the frequency of obesity is increasing. Therefore treatments and preventive measures appear to be having little or no impact on the control of body weight. Considering the processes underlying energy regulation in the obese, it has been suggested that the condition represents a disorder of appetite control (Prentice et al., 1989).

Inspection of the distribution of body mass index (BMI) in the population of the UK makes it apparent that overweight (BMI>25 kg/m^2) is much more common than underweight (BMI<20 kg/m^2). In turn, this means that it is much easier for human beings to gain weight than to lose weight – at least in societies where there is an abundance of food. How does this relate to appetite control? It is clearly very difficult to lose weight by attempting to undereat. Although dieting has been a prominent feature of the life-style for at least a decade this type of behaviour has not prevented an increase in the frequency of weight gain. It appears to be very difficult to eat less energy than the body expends. Undereating rapidly generates a biological drive which promotes eating. On the other hand, it seems relatively easy for people to overeat. It

can be assumed that obese people are not deliberately trying to consume extra calories in order to gain weight. Therefore the appetite control system contains potent mechanisms which prevent undereating but has a weak defence against overeating. The large fat stores in obesity do not appear to exert inhibitory influence on the biological drive to eat. Consequently, whereas undereating must be a deliberate and disciplined action, overeating seems to occur passively without any apparent effort on the part of the eater. For many individuals biological mechanisms which prevent overeating are poorly developed and can be easily overridden. This state of affairs is particularly problematic when the environment contains an abundance of palatable foods of a high energy density.

Appetite – restrained by sweetness, carbohydrates, or both?

For several years artificial (or high-intensity) sweeteners have been welcomed as a means to reduce energy intake and it has sometimes been claimed that they can be used as dietary aids to effect weight loss. This implies that artificial sweeteners can restrain the expression of human appetite. In practice, high-intensity sweeteners replace sweet carbohydrates in dietary products. Does this replacement (which creates a caloric deficit) lead to caloric compensation?

In broad terms human appetite is reflected in conscious sensations of hunger, the pattern of energy intake and preferences for different types of foods. One central concept in appetite control is satiety – the decrease in hunger and the suppression of eating that follows food consumption. Different types of food exert varying effects on the intensity of satiety; this is referred to as the satiating efficiency of food. Some years ago it was claimed that the sensory characteristics of food (for example sweetness) contribute a major component to satiating efficiency which could be more important than energy context. Studies compared the effects of foods of equal sweetness (containing either aspartame or sucrose) which differed in their content of carbohydrate calories. A series of studies appeared to indicate that sweetness could induce satiating efficiency. However these experiments were methodologically flawed since in most cases taste testing and the consumption of food samples were carried on periodically between the eating of the sweet foods and the test for satiating efficiency. These early studies provided an optimistic view of the restraining effect of artificial sweeteners on appetite but the conclusions have now been reversed. Whereas it was formerly claimed that 'High-intensity sweeteners such as aspartame in foods do not appear to differ from sucrose in how they influence ... food intake' (Rolls et al., 1988, p. 66), the current view is quite different. In contrast, in a later study the carbohydrate content of the lunch was reduced and most of the manipulation was due to substitution of aspartame for sugar. The subjects made up for the difference in calories in lunches every day of the experiment and this compensation was seen by dinner time (Rolls, 1991, p. 876). These later studies indicate that substituted carbohydrates do not offer any special advantage to the consumer for controlling appetite (Foltin et al., 1990).

The results of experimentally sound studies appear to demonstrate that caloric value is a major component of satiating efficiency. In a series of studies using carbohydrates

such as glucose, fructose and malto-dextrins later food intake has been suppressed by an amount similar to the carbohydrate calories delivered (e.g. Rogers et al., 1988; Rogers & Blundell, 1989). These studies support the idea of some type of glucostatic mechanism in the short-term control of appetite and demonstrate the phenomenon of caloric compensation. In the absence of these calories (when there is carbohydrate substitution) hunger returns sooner and subsequent energy intake is higher.

Sweetness without calories does not appear to provide a potent restraint over appetite. That is, sweetness per se does not provide biological help to enable a person to reduce food intake. However it could still be argued that individuals able to satisfy their desire for sweetness through consuming artificial sweeteners would be better able to consciously and deliberately restrict other aspects of their diet. Is there any evidence that this occurs on a large scale? The epidemiological study of Stellman & Garfinkle (1986) indicated that women who used artificial sweeteners tended to gain a little more weight over the course of one year than those who did not. These data are hard to interpret and it should not be inferred that artificial sweeteners cause weight gain. However, the study certainly indicates that the use of sweeteners does not prevent weight gain. In a clinical study of obese subjects the effect of the inclusion of artificial sweeteners in the prescribed diet was studied within a rigorously controlled weight loss programme (Kanders et al., 1988). The results were ambiguous: female subjects lost more weight when sweeteners were included but men lost less. Overall, weight changes were not statistically significant.

One feature which militates against good control over appetite through the manipulation of sweetening agents is that sweetness is such a potent psychobiological phenomenon. Artificial sweeteners have a potent action on sweet taste receptors and stimulate cephalic phase responses (physiological mechanisms which prepare the body to receive food). Consequently, it is possible that sweetness per se (mediated by artificial sweeteners) could stimulate appetite. Under certain experimental conditions sweet and non-sweet foods (equal in energy content) do exert different effects on hunger and food intake (Rogers & Blundell, 1989). The best interpretation of this effect is that sweetness (because of its powerful effect on afferent receptors in the mouth and its hedonic properties) tends to weaken satiety. This action appears to be intensified when subjects are informed about the foods they are consuming. In a recent study Mattes (1990) compared the effects of equicaloric breakfasts, sweetened with aspartame or sucrose, with an unsweetened breakfast. Analysis of subsequent food intake (lunch, dinner, snacks) indicated a significant breakfast cereal × meal interaction. 'Post hoc tests indicated that lunch and dinner meals were significantly larger following the aspartame cereal than after either the plain or sucrose-sweetened cereal' (Mattes, 1990, p. 1040 and Fig.3 on p. 1041). This effect was greater in subjects who knew the composition of the breakfasts.

Carbohydrate substitution (by sweeteners): is it effective?

Within the past few years a variety of studies have investigated the action of sweetness (additive design) or carbohydrates (substitutive design) on short-term

control of appetite. These studies have produced conflicting sets of data. However, it appears to be now agreed (even among researchers who formerly held different views) that the substitution of sweet carbohydrates for high-intensity sweeteners does induce caloric compensation. That is, people tend to eat more later to make up for the energy saved. This may reflect a demand for carbohydrate by the body together with a suppression of appetite by ingested carbohydrate. Consequently, it does appear to be difficult to undereat (diet) simply by substituting artificial sweeteners for carbohydrates. It appears that the casual use of artificial sweeteners (in the absence of any additional form of dietary restriction) is of little assistance in controlling the expression of human appetite.

Dietary fat and appetite control

It is widely recognised that the consumption of dietary fat in many societies is unacceptably high. For example, a recent survey carried out by the Office of Population Consensus and Surveys (OPCS, 1990) between the years 1986 and 1987 revealed that average daily fat intake for British men was 102 g and that this accounted for 40.2% of total food energy. For women the figures were 73 g and 40.3%. These figures are considerably in excess of the 35% of food energy recommended in the reports of a number of advisory bodies in the UK. In turn, it is known that a dietary intake high in fat (reflected by the food quotient, FQ) is strongly correlated with weight gain (Tremblay et al., 1989). Moreover, Lissner et al. (1987) have demonstrated that subjects underate when forced to eat low-fat foods for 3 weeks and overate (relative to a medium-fat diet) when obliged to select from an assortment of high-fat foods. During the period on the high-fat diet subjects consumed an additional 1.52 MJ per day (surfeit of 15.4%) compared to the medium diet and gained an average of 0.32 kg body weight. The results of these studies suggest that people exposed to a high-fat diet display a passive tendency to overconsume calories. The excessive energy intake does not appear to be subjected to any potent inhibitory action from the monitoring of the ingested fat. This has been confirmed in a recent series of experiments in which the addition of fat (1.68 MJ) to a small meal (1.85 MJ) did not intensify the effect of that meal on satiety (Blundell et al., 1992). Moreover, when freely selecting from a range of high-fat foods subjects consume from 50 to 100% more energy than when consuming high-carbohydrate foods. These additional 'fat calories' do not lead to a subsequently greater suppression of appetite. Therefore it appears that fat exerts a weak effect on both satiation (within meals) and satiety (following meals). It also appears that the addition of fat to foods produces a weaker effect on satiety than carbohydrate. These mechanisms could account for the capacity of a high-fat diet (high FQ) to lead to passive overconsumption and weight gain.

Unfortunately, not all studies agree on this issue and some experiments appear to demonstrate that fat and carbohydrate have an equal satiating power (Rolls et al., 1991; Foltin et al., 1990). However, in interpreting experiments on nutrient manipulations care must be taken to dissociate nutrient effects on post-ingestive (but pre-absorptive) events from post-absorptive action, for example, nutrient effects on

gastric distention (a pre-absorptive event would be expected to be similar whilst post-absorptive effects would certainly be expected to exert differing time courses of action). A further issue concerns the examination of the effects of fat withdrawal (fat minus manipulation) versus fat supplementation (fat plus manipulation) (Blundell & Burley, 1991). Whereas the fat minus manipulation may induce upward compensation, it cannot be deduced that fat supplementation will lead to downward compensation (later undereating). For the moment, the accumulating evidence suggests that high levels of dietary fat exert a disproportionately weak restraint over the expression of appetite. However, there may be circumstances in which its action could be amplified.

Likely effects of fat substitutes on appetite control

The substitution of dietary fat seems to be a more potent manipulation for achieving dietary adjustment than the substitution of dietary carbohydrate. Moreover, this would be in keeping with widespread dietary guidelines aimed at reducing fat intake. 'Light' products, if widely consumed, should prevent passive overconsumption of calories or, at least, weight gain. A more disciplined attempt to restrict fat intake could lead to weight loss. Consequently, fat-reduced products could prove to be quite helpful.

The effects of fat substitution are certain to depend upon the organoleptic properties of the material used for substitution. For example, a non-absorbable substitute such as sucrose polyester is not to be expected to produce similar effects to micro-particulated protein. Indeed, the actions of fat replacers will depend upon their own caloric value (varying from 0 to about 21 kJ/g) and their precise chemical formulation. Some formulations may be active on appetite mechanisms whereas others may be inert. One study suggests that these fat substitutes (at least of the sucrose polyester type) may be useful in allowing an increase in carbohydrate intake in exchange for reduced fat intake (Blundell et al., 1992). This action alone could be of considerable value.

Information on the effects of fat substitutes on appetite is still scanty. However, the situation looks promising and the near future should yield some intriguing research.

Appetite control by dietary manipulation

The modulation of food consumption demands a certain degree of voluntary application. People can deliberately undereat (to the point of starvation) and can voluntarily 'eat around' a potent appetite restriction such as jaw wiring or intestinal surgery. The mere presence of light foods in the market place (alongside high-energy counterparts) alone is unlikely to lead to dramatic shifts in average measures of body mass index. People may be induced to compensate or to continue to passively overconsume on the available high-energy products. However, whilst adjustment of the food supply is not a 'sufficient' condition for gaining control over appetite it comes close to being a 'necessary' condition. With the appropriate motivation and guidance people could judiciously adjust their diet to prevent unnecessary overconsumption and to arrest the rise in overweight.

References

Blundell JE & Burley VJ, 1990. Evaluation of the satiating power of dietary fat in man. In: Oomura, Y, Baba S & Shimazu T (Eds.) Progress in Obesity Research 1990, pp. 453-457. J. Libbey & Sons, London,

Blundell JE, Burley VJ & Peters JC, 1992. Dietary fat and human appetite: energy compensation for non-absorbable fat. In: Hosoya N, Romsos D, Suzuki M, Shimomura Y (Eds.) Diet and Obesity, pp.3-13. Japan Scientific Societies Press, Tokyo.

Blundell JE, Burley J, Cotton J & Lawton C, 1992. Dietary fat and appetite control: weak effects on satiation (within meals) and satiety (following meals). In: Mela D (Ed.) Determinants of preference, selection and consumption of dietary fats. Elsevier, Cambridge.

Foltin RW, Fischman MW, Moran TH, Rolls BH & Kelly TH, 1990. Caloric compensation for lunches varying in fat and carbohydrate content by humans in a residential laboratory. Am J Clin Nutr 52: 969-980.

Kanders BS, Lavin PT, Kowalchuk MB, Greenberg I & Blackburn GL, 1988. An evaluation of the effect of aspartame on weight loss. Appetite 11:.73-84.

Lissner L, Levisky DA, Strupp BJ, Kackwarf H & Roe DA, 1987. Dietary fat and the regulation of energy intake in human subjects. Am.J Clin Nutr 46: 886-892.

Mattes R, 1990. Effects of aspartame and sucrose on hunger and energy intake in humans. Physiol Behav 47: 1037-1044.

NACNE – National Advisory Committee for Nutrition Education, 1983. Proposals for nutrition guidelines for health education in Britain. Health Education Council , London.

OPCS – Office of Population Censuses and Surveys, 1990. The Dietary and Nutritional Survey of British Adults. HMSO, London, 393 pp.

Prentice AM, Black AE, Murgatroyd PR, Goldberg GR & Coward WA, 1989. Metabolism or appetite: questions of energy balance with particular reference to obesity. J Hum Nutr Dietet 2: 95-104.

Rogers PJ & Blundell JE, 1989. Separating the actions of sweetness and calories: effects of saccharin and carbohydrates on hunger and food intake in human subjects. Physiol Behav 45: 1093-1099.

Rogers PJ, Carlyle J, Hill AJ & Blundell JE, 1988. Uncoupling sweet taste and calories: comparison of the effects of glucose and three high intensity sweeteners on hunger and food intake. Physiol Behav 43: 547-552.

Rolls BJ, 1991. Effects of intense sweeteners on hunger, food intake, and body weight: a review. Am J Clin Nutr 53: 872-878.

Rolls BJ, Hetherington M & Laster LJ, 1988. Comparison of the effects of aspartame and sucrose on appetite and food intake. Appetite 11: 62-67.

Rolls BJ, Kim S, McNelis AL, Fischman MW, Folton RW & Moran TH, 1991. Time course of effects of preloads high in fat or carbohydrate on food intake and hunger ratings in humans. Am J Physiol 260: R756-R763.

Stellman SD & Garfinkel L, 1986. Artificial sweetener use and one-year weight change among women. Prevent Med 15: 195-202.

Tremblay A, Plourde G, Despres JP & Bouchard C, 1989. Impact of dietary fat content and fat oxidation on energy intake in humans. Am J Clin Nutr 49: 799-805.

Benefits of biotechnology from a food production, food processing, and nutrition policy perspective

M. Horisberger

Nestec Ltd., Vevey, Switzerland

Abstract

Biotechnology can benefit agriculture in many ways by (1) maintaining genetic diversity, (2) increasing crop yield, (3) lowering costs of agricultural inputs, (4) managing weeds and insect pests, and (5) affording more nutritious and higher-quality raw materials. The latter include lower-fat meats, oil seeds with modified fat content and fatty acid profile and vegetable with a longer shelf-life. Biotechnology can contribute to food processing by (1) producing enzymes and other food processing aids, (2) improving the production of additives and ingredients such as vitamins, amino acids and antioxidants, (3) reducing the level of anti-nutritional factors, (4) improving such traditional processes as fermentation, and (5) increasing shelf-life and safety of processed foods. Specific examples are discussed with respect to healthy, safe, affordable and adequate food supply, the overall goal of food and nutrition policies. Human health will benefit most from biotechnology through the improvement of food safety and the modification of nutrient compositon of raw materials (especially fatty acids and proteins). In developed countries where a variety of food is available, education for healthy food choices will have a greater impact than restrictive measures imposed on food producers and consumers.

Introduction

Following the definitions of the Office of Technology Assessment of the United States Congress (1), biotechnology can be described in the broad sense of the term as any technique that makes use of living organisms or parts of organisms to make or modify products, to improve plants or animals or to develop microorganisms for specific uses. A second definition, more narrow in scope, refers only to 'new' biotechnology: the industrial use of rDNA, cell fusion and novel bioprocessing techniques. In this paper, the term 'biotechnology', unless otherwise specified, is used in reference to 'new' biotechnology.

Since World War II, technologies derived from physical sciences and chemistry have dominated the world economy. In the future, many predict that this role will go

to biotechnology. Biotechnology is less than 20 years old. In that period of time, it has resulted in the commercialization of products that can dramatically improve human and animal health, food supply, and the quality of environment. The first gene was cloned in 1973. The first expression of a plant gene in a plant of a different species was achieved in 1983. The first bio-engineered food additive was approved by FDA in 1990 (chymosin for cheese production).

While the market for agricultural biotechnology today remains small, the year 2000 may witness the advent of a USD 10–11 milliard business. Part of the world market held by biotechnologically produced products may reach 5% for agriculture and 28% for agri-food.

Biotechnology has the potential to increase food production by contributing to further gains in yield, by lowering the cost of agricultural inputs and by contributing to the development of new high-value-added products to meet the needs of consumers and food processors (Anon., 1991).

Many early claims about agricultural biotechnology were premature, the reasons of which are manyfold. Agricultural biotechnology has developed at a slower pace than biomedical basic research, partly because alterating whole plants and animals is trickier than transforming microbial or animal cells to produce a single protein to be used as a drug, partly because researchers have to wait for growing seasons or for gestation cycles in animals to test their hypotheses. The existence of regulatory hurdles and/or the absence of specific regulations in many countries have also contributed to slow the pace of research. Finally, public concern about possible environmental risks and ethical issues has often been translated into regulations that discourage field testing of genetically engineered plants and microorganisms.

Today, more than 50 species of plants can be genetically modified. The major crops that have been engineered are listed in Table 1. The list includes almost all major dicotyledonous crops and a rapidly increasing number of monocotyledonous crops, including rice and maize. Current research may lead to routine gene transfer systems for almost all major crops within 2–3 years. Nevertheless, many plants are still recalcitrant and nothing is known about their transformation and regeneration (Jones, 1992).

Agriculture and food production

Initially research in plant biotechnology has concentrated on developing plants resistant to biodegradable herbicides, insects and various pests.

Insect resistance was first achieved by expressing DNA coding for insecticidal proteins from *Bacillus thuringiensis* (Höfte & Whiteley, 1989). For example, tomato plants carrying a gene for a *B. thuringiensis* protein toxic to tomato fruitworm and tomato pinworm were largely protected against these pests (Delannay et al., 1989). Another protein isolated from cowpea which is toxic to major pests has also a wide potential applicability by disrupting insect gut function as does the *B. thuringiensis* protein (Jones, 1992; Delannay et al., 1989; Hilder et al., 1990).

In weed control, herbicide-tolerant plants have been generated in three ways by (1)

Table 1. Crops that have been genetically engineered.

apple	cucumber	rice
asparagus	French bean	rye
barley	grapevine	soya bean
cabbage	lettuce	sprout
Capsicum spp. (pepper)	liquorice	strawberry
carrot	lucerne (alfalfa)	sugar beet
celery	maize (corn)	sunflower
clover	oilseed rape	tomato
cotton	pear	turnip
cowpea	potato	wheat

From Jones (1992).

altering the level and (2) altering the sensitivity of the target enzyme to biodegradable herbicides, and (3) incorporating a gene for an enzyme that inactivates the herbicide (Llewellyn et al., 1990).

Several strategies are available for engineering virus-resistant plants but the most successful approach appears to be 'coat protein-mediated resistance'. The mechanism is still largely unknown but could involve the production of a compound that inhibits virus replication. Expressing the coat protein gene of a virus in a transgenic plant confers resistance to a variety of diseases to a degree of control that is otherwise unobtainable (Jones, 1992). The approach has been applied to a range of food crops such as tomato, potato, melon, rice, soya bean and cucumber (Nelson et al., 1990).

Biotechnology could also greatly help at adapting plants to stress, viz. climatic conditions and soil composition. Many plant genes induced by stress such as heat, cold, salt and heavy metals have already been identified (Benfey & Chua, 1989).

Other opportunities arise such as improving raw materials by selecting the right varieties of a particular crop, for example for homogeneous ripening and longer storage capacity. There are transgenic bruise-resistant tomatoes engineered by antisense RNA technology to reduce the production of polygalacturonase, a softening enzyme (Sheehy et al., 1988). Fruit ripening can be delayed in tomato by antisense RNA to enzymes involved in ethylene production (Hamilton et al., 1990). Progress is also expected in improving colour and flavour of fruits by manipulating bioflavonoid biosynthesis.

In oilseeds, fatty acid saturation and chain length could be modified, but success will depend largely on a better understanding of lipid metabolism in plants. In canola, the stearic acid level has been significantly increased (Fraley, 1992).

The nutritional value of seeds can be improved by expressing genes coding for proteins rich in a particular amino acid. For instance, a gene coding for a methionine-rich Brazil nut has been inserted into oilseed rape plants which produced seeds with increased methionine content (Altenbach & Simpson, 1990). Another avenue is to

overexpress native genes coding for methionine-rich proteins which have been identified in maize, sunflower and rice.

Altering protein sequences may also lead to development of flour with better baking qualities (Flavell et al., 1989).

The use of high-yield varieties narrows the genetic basis of agricultural production. The genetic uniformity of modern cultivars may lead to greater vulnerability of crops, due to a narrow genetic base and large acreages under a single cultivar. The diversity of genetic resources must be maintained at the ecosystem, species and genetic levels (Lévêque & Glachant, 1992). Biotechnology in the broad sense of the term can be applied to preserve genetic diversity (e.g. cryopreservation techniques) and RFLP maps may help to determine which of the cultivars must be preserved.

The loss of species can have a negative impact on the genetic improvement of modern varieties. If it were not for the discovery in Peru of a wild tomato species, a new variety with an increased sugar content may not have been developed so soon (Jones, 1992).

Genetic alteration of animals to serve human needs is a centuries-old process. Biotechnology has now the potential to accelerate this process and produce, for example, animals with lower fat content or modified milk composition. However, using transgenic livestock as food is not expected before the end of the century.

In view of these applications, many of which are still in the experimental phase, one can foresee that the use of biotechnology will have a profound impact on agriculture with major implications for agriculture policies. At this stage, it appears that agricultural productivity will come more from the reduction of waste and spoilage than from intrinsic high productivity.

Food processing

One of the characteristics of food industry is its slow evolution towards technological changes. However, while traditional biotechnologies have far from exhausted their possibilities, there is no doubt that the food industry will make soon or late a large use of 'new' biotechnology in food processing.

Food processing will make use more widely of enzymes not only to modify the texture and taste of food products, but also to improve nutritional quality and health safety. Enzymes can be utilized in various new ways. For instance, enzymes can be immobilized on a solid support. New and potential applications of immobilized enzymes are: improvement of beer processing and cheese manufacture, modification of the composition of vegetable oils, starch transformation into fructose sirup, removal of lactose from lactoserum. For solid foods, better control of enzyme activity could be obtained by encapsulating enzymes in, for xample, liposomes (Ducastaing & Adrian, 1990).

However, traditional enzymes can behave in a less than optimal manner. Therefore, biotechnology could, for example, contribute by tailoring enzymes specifically (Law, 1990) to increase thermostability or to remove antinutritional factors such as phytate and antitrypsins in soya beans.

Biotechnology has already been applied to improve food processing by producing enzymes (i.e. chymosin for the cheese industry) and other processing aids. There is a growing interest in developing genetically engineered food-grade microorganisms for the production of high-value compounds currently isolated from plants. Among these products are dyes, vitamins, colours, lipids and antioxidants (Bell & White, 1989). It can also be envisaged that such microorganisms will be used during fermentation processes to increase the level of specific products. Microorganisms could also be adapted to contribute to improving food conservation in the absence of chemical agents (Gasson, 1990). One of the most promising applications is given by lactic bacteria which are largely used in milk products and other fermented products including fish and meat. For instance, some lactic bacteria produce antimicrobial substances such as nisine. When all the genes implicated in the synthesis of nisine will be identified, they could be eventually transferred into lactic strains normally used in food processing.

On a much longer term, fermented products may contain bacterial strains which would colonize the gut and reduce, to some extent, gastro-intestinal disorders, or lactase-containing strains for hydrolysing residual lactose in the gut of lactose-intolerant individuals.

Biotechnology can also contribute to improving such processing characteristics as viscosity, elasticity and emulsifying properties of raw materials. For instance, it has been possible to improve pulp viscosity by turning down the expression of the polygalacturonase gene in ripening fruits (Sheehy et al., 1988; Kramer et al., 1989). Improving the bread-making properties of wheat (Flavell et al., 1989) and the emulsifying properties of soya protein extracts (Creamer et al., 1988) are being investigated.

These few examples serve to demonstrate that biotechnology will help not only at modifying the texture or taste of food products, but also at improving their nutritional quality and health safety.

Nutrition policy

The goal of a nutrition policy is to integrate nutrition objectives based on current scientific knowledge into strategies of governments and national or international organizations. Nutrition policies relate to specific nutrient intake and should not be confused with food and agriculture policies. The coordinated development and implementation of agriculture, food and nutrition policies require a broad approach that goes beyond the food production-consumption chain. Hence the relatively new nutritional objectives of preventing chronic non-communicable diseases may have implications for the economics of farming. In that respect, more coherent policies should be developed.

Raw materials, ingredients and processes are all amenable to considerable improvement through biotechnology. We do not believe that the future of biotechnology in agriculture is necessarily for high-priced commodities, but doubt that biotechnology will contribute to change dietary pattern in developed countries. The possibility to

achieve higher standard of safety and health is a major opportunity for the industry. When properly applied, biotechnology may well ease the task of modifying diets to meet dietary recommendations.

However, applications of biotechnology in food production and food processing will depend less on technical issues than on non-technical ones, such as regulatory approval, proprietary protection and public perception. The analysis of public attitude is difficult since (1) few studies are available on the reactions of consumers towards agro- and food biotechnologies, (2) as biotechnology in the broad sense of the term covers a wide variety of technologies and specific applications, the public perception is still vague and confuse, and (3) while in developed countries consumers are increasingly aware of the relationship between good nutrition and health, at the same time they often distrust new technologies.

The applications of biotechnology will parallel proper education and good information to the public. Governments have the responsability to inform the public about biotechnology but, as an essential partner, industry must provide the relevant information. The evaluation of the quality and objectivity of the information requires the participation of government, industry and experts. If benefits, risks and emotive aspects of biotechnology are properly set in perspective, it cannot be doubted that human health will benefit from agricultural and food biotechnology, particularly through the modification of the nutritional value of plants and livestock, and the improvement of food safety. In developed countries, where a variety of food is available, education for healthy food choices will have a greater impact than restrictive measures imposed to food producers and consumers.

References

Altenbach SB & Simpson RB, 1990. Manipulation of methionine-rich protein genes in plant seeds. Trends Biotechnol 8: 156-160.

Anonymous, 1991. Biotechnology in a global economy. U.S. Congress, Office of Technology Assessment , OTA-BA-494. U.S. Government Printing Office, Washington, DC , October 1991.

Bell ER & White EB, 1989. The potential of biotechnology for the production of flavours and colours for the food industry. Int Industr Biotechnol 9: 20-26.

Benfey PN & Chua NH, 1989. Regulated genes in transgenic plants. Science 244: 174-181.

Creamer LK, Jimenez-Flores R & Richardson T, 1988. Genetic modification of food proteins. Trends Biotechnol 6: 163-169.

Delannay X, La Vallee BJ, Proksch RK, Fuchs RL, Sims SR, Greenplate JT, Marrone PG, Dodson RB, Augustine JJ, Layton JG & Fishhoff DA, 1989. Field performance of transgenic tomato plants expressing the *Bacillus thuringiensis* var. *kurstaki* insect control protein. Bio/technology 7: 1265-1269.

Ducastaing A & Adrian J, 1990. Les enzymes en technologie alimentaire. Sci Aliments 10: 231-254.

Flavell RB, Goldsbrough AP, Robert LS, Schnick D & Thompson RD, 1989. Genetic variation in wheat HMW glutenin subunits and the molecular basis of bread-making quality. Bio/technology 7: 1281-1285.

Fraley R, 1992. Sustaining the food supply. Bio/technology 10: 40-43.
Gasson MJ, 1990. Genetic manipulation of starter cultures. Dairy Ind Int 55 (5): 21-23.
Hamilton AJ, Lycett GW & Grierson D, 1990. Antisense gene that inhibits synthesis of the hormone ethylene in transgenic plants. Nature 346: 284-287.
Hilder VA, Gatehouse AMR & Boulter D, 1990. Genetic engineering of crops for insect resistance using genes of plant origin. In : Lycett GW & Grierson D (eds.), Genetic engineering of crop plants. Butterworths, London.
Höfte H & Whiteley HR, 1989. Insecticidal crystal proteins of *Bacillus thuringiensis.* Microbiol Rev 53: 242-255.
Jones JL, 1992. Genetic engineering of crops: its relevance to the food industry. Trends Food Sci Technol 3: 54-59.
Kramer M, Sheehy RE & Hiatt WR, 1989. Progress towards the genetic engineering of tomato fruit softening. Trends Biotechnol 7: 191-194.
Law BA, 1990. Tailoring enzymes for food users. Food Technol Int Europe 1990: 161-165.
Lévêque F & Glachant M, 1992. Diversité génétique. Recherche 23: 114-123.
Llewellyn D, Lyon BR, Cousins Y, Huppatz J, Dennis ES & Peacock WJ, 1990. Genetic engineering of plants for resistance to the herbicide 2,4-D. In: Lycett GW & Grierson D (eds.), Genetic engineering of crop plants. Butterworths, London, 1990.
Nelson RS, Powell PA & Beachy RN, 1990. Coat protein-mediated protection against virus infection. In: Lycett GW & Grierson D (eds.), Genetic engineering of crop plants. Butterworths, London, 1990.
Sheehy RE, Kramer M & Hiatt WR, 1988. Reduction of polygalacturonase activity in tomato fruit by antisense RNA. Proc Natl Acad Sci USA 85: 8805-8809.

Modern food technology and consumer concerns

Christiane Toussaint

Bureau Européen des Unions de Consommateurs (BEUC), Bonn, Germany

Introduction

The application of 'modern food technology' creates a large potential for new types of products and new production methods. New techniques will increasingly affect modern food supply. Industrial bodies are in favour of new techniques and make claims about possible benefits to the consumer and the public interest at large. However consumers and consumer organizations show more reluctance towards new techniques and do not welcome them as warmly as does the industry. A study performed for the European Commission concludes that this lack of enthusiasm is partly due to a lack of transparency and ignorance. On the other hand, BEUC believes that this reluctance arises from genuine concerns which should be taken seriously and which should play an important role in decision-making processes with regard to these technologies.

This paper will mainly focus on the use of genetic engineering in food production.

New techniques: claimed benefits and possible risks

Application of such new technologies as genetic engineering offers new possibilities for creating new products or for improving existing ones and thus provides possible advantages for consumers.

Benefits claimed include the improvement of industrial production processes (e.g. modified bakers' yeast having an increased rate of action), the development of new or 'better' products (e.g. fat substitutes like Simplesse) and the solution of urgent questions such as environmental problems, diseases in husbandry, and starvation and supply shortages in the Third World (e.g. development of modified plants resistant to herbicides).

Quoting these advantages, new technologies seem to be the most important tool for solving long-term and short-term problems and for improving overall food supply.

BEUC is aware of possible benefits to the public, such as improved food safety, lower prices or new products with an improved nutritional value contributing to the solution of current nutritional problems, but we are aware as well of possible disadvantages and risks. In BEUC's opinion, there is a tendency to underestimate problems especially in the case of biotechnological products. Knowledge about genetic technology seems to be still limited, so that reliable predictions are hard to made.

Concerning the use of genetically manipulated organisms (GMOs), critical voices

point to many possible risk factors. First, genes are introduced to obtain products that have no history of human consumption, such as insecticidal toxins and growth factors. The effects of introduction or deletion of genetic traits on the organism as a whole are hard to predict. Second, one should always be aware of possible effects on nutrient balance and on the balance of natural toxins. Third, in microbial production methods, the identity and purity of compounds may differ from traditional methods (a good example is the *L*-tryptophan case). Finally, when viable micro-organisms, or large fractions of their cells, are consumed it is important to investigate the effects on the immune system and the interaction with micro-organisms in the human intestine, including the possibility of gene transfer.

As regards the benefit of providing a solution to environmental problems caused by intensive agriculture, it makes sense that modern biotechnology could be used to reduce the dependence on pesticides and fertilizers and to switch to more benign substances. On the other hand, modern biotechnology can counteract the aim of reducing intensive agriculture. For example, herbicide-resistant crops make the use of herbicides more attractive, bovine somatotropic hormone (BST) can lead to more intensive stock farming methods, and application of insecticidal toxins to engineered plats will soon reduce their efficiency owing to the development of resistance. Environmental problems which could be prolonged by modern biotechnology are dependence on agrochemicals, disease vulnerability, loss of genetic diversity and, last but not least, the possible release of GMOs into the environment.

Focusing on Third World problems, BEUC only wishes to stress the point that, apart from possible environmental problems, economic problems could arise from a lack of proper control measures. The increasing interchangeability of raw materials can lead to large, potentially devastating effects on local economies. Third World agriculture will be more closely linked to the global economy, and in the end the Western countries with their huge buying power will benefit more than the Third World countries themselves.

BEUC is aware that all techniques entail a certain risk. But there still remains a need to discuss acceptability. The levels of acceptable risks have to be discussed publicly and should be weighed against both real benefits and alternatives. For example, a possible solution for environmental problems could be organic or integrated farming methods, which rely on mechanical weed removal, crop rotation or mixed variety cultures.

In BEUC's opinion, pressures exerted to use modern techniques, in particular biotechnology, are very strong – which is to be attributed not only to potential benefits but also to strong economic interests. The current situation is that there is a severe shortage of knowledge and no experience at all with long-term surveillance. Before a substance or a process can be authorized a broad risk assessment is indispensable (including such factors as the environmental impact and long-term nutritional effects) covering not only the safety of the final product but also problems that could be caused by the production process. Safety and other aspects of the products should also be controlled by marketing surveillance.

New techniques and consumer concerns

What do consumers think about biotechnology and how are their decisions taken? Many studies have been devoted to this subject. We would like to summarize here some results of an EC study measuring consumer awareness and attitudes towards biotechnology (Eurobarometer Study. European Biotechnology Information Service (EBIS), No. 4, July 1991). For this survey 12 800 people were interviewed (300 in Northern Ireland, 500 in Luxembourg, 2000 in Germany (East and West) and 1000 in each of the other Member States).

The results of the survey show that:

- 80% of the respondents think that new technologies will improve life of mankind
- 50% of the respondents think that biotechnology/genetic engineering will improve their own life
- 11% fear that it will make thinks worse (figures differ markedly among the Member States, from 2% in Portugal tot 24% in Denmark)
- 28% do not know anything about the impact of biotechnology, ignorance being greatest in Portugal (50%) and lowest in Germany (17%); interestingly, Portugal was also the country with the least fear.

The study showed that in the countries where the awareness is greatest (which could be compared with the highest familiarity with these techniques) acceptance is relatively low and risk perception high. In our opinion, this finding conflicts with the popular view that acceptance is just a question of more information on safety and the possible benefits of the technique.

Moreover, it is not only of a lack of information or ignorance that makes consumers reluctant to see new techniques used in food production. In general, many consumers perceive a conflict between these technologies and their beliefs about nature, mankind or religion or their ideas about food quality. Therefore, safety or information alone does not automatically lead to the acceptance of a product or a production process.

Food quality and consumer understanding

Consumers decide in a very complex what food to buy and how to define food quality. Consumers concerns reflect an array of personal attitudes and beliefs, which go beyond a purely pragmatic view of self-interest (low price or maximum choice). Therefore, these benefits are increasingly losing the value they once had.

Quality of a particular foodstuff also includes safety, nutritional value and sensory aspects, which are important determinants of consumers' choice. Other factors are playing an increasing role as well. Consumers are becoming more and more aware of other aspects such as the level of contamination, the use of additives, the production method (e.g. ecologically sound production methods) and animal welfare.

The usefulness of a product can no longer be assessed only on a basis of low prices and a broad choice. We see that some aspects considered by consumers in choosing a

product can be assessed scientifically. Other aspects are of a psychological nature and difficult to define. Among the latter aspects are considerations related to ethics. In BEUC's opinion, ethics is more than the discussion on moral justification of genetic engineering of animals and man. It also comprises the role of science and technology in our society, the status of nature and the value-loaded opinions on the approach to risks.

New technologies and consumer demands

The subject of modern technologies and their use in food production has been discussed more frequently in governmental and non-governmental bodies than in scientific or industrial fora. In our opinion, however, the separation between the parties in the debate is no longer tenable. A dialogue is necessary, and communication and transparency must be established among politicians, retailers, industry and consumer organizations. Consumer concerns must be taken seriously and not looked upon as 'hysterical reactions'. Consumer organizations wish to help consumers by offering additional information and to support consumers to become aware of their personal market power.

With regard to new technologies and foodstuffs produced by these methods, European consumer organizations have developed the following points which, in their opinion, must be assessed and carefully taken into consideration.

1. New technologies should be used to create products meeting consumer demands
Aspects other than safety are becoming increasingly important in consumer decisions about products. These aspects play a role in highly personal consumer decisions about the 'quality of foodstuffs' and should be taken into account when authorizing new foodstuffs. Consumers may not see the necessity of new techniques. However, for BEUC it is not the point that there is too little understanding or too much ignorance to recognize the need, but rather that consumers have their own personal understanding of food quality which should be respected. If their personal attitudes do not fit in with the product they will not accept it.

2. Broad safety assessment is necessary before a product can be authorized
Foodstuffs in general should only enter the market if they are safe for the consumer. Consumers expect these provisions to be observed by producers and authorities. If there is any risk, necessity and risk should be weighed very carefully. A broad risk assessment encompassing, among other things, nutritional and environmental evaluations is necessary before authorization can be considered. Safety and side-effects of the products should be monitored by market surveillance.

3. Consumers should have freedom of choice
Consumers must be given the freedom of choice in their decision to buy or not to buy a product. Freedom of choice can be ascertained only by completely and clearly labelling the products and by providing additional information. Labelling of foodstuffs

produced with 'new' techniques has been a subject of vivid and emotional debate between industry, politicians and consumer organizations. The European Commission (commissioner Bangemann), in a press conference, recently expressed the opinion that 'novel foods' that do not threat human health should not carry additional labelling making mention of a new production technique because such information would cause 'hysterical reactions' among consumers. We do not wish to discriminate against products through labelling. Neither do we wish to practice policy by whipping up fears. However we feel that consumers must be given the right to base their choice on personal considerations. We agree that additional information will not necessarily lead to greater acceptance. There will remain some lack of understanding and consumers' personal perceptions as to the quality of foodstuffs. However, in our opinion, there is little evidence to support the view that labelling is likely to cause an upsurge of negative reactions. The opposite is more plausible: it is secrecy that can, and probably will, give rise to unpredictable fears and to an over-emphasis of the risks.

4. Transparency of the whole research and authorization procedure is essential
Labelling can only be part of a wider array of information for consumers and also for consumer organizations. After the results of the Eurobarometer survey, the European Commission decided that information campaigns must be started. Consumer organizations may participate in these campaigns and can also contribute to the establishment of information centres as well as the dissemination of independent and balanced information. Consumer organizations should be involved in the authorization process for food products and research results should be available to the public.

5. There is an urgent need for establishing a legislative structure
The current situation of legislation in the Member States of the EC, and also at the EC level, is not sufficient and in no way coordinated. Legislation with respect to food products should guarantee consumer safety, freedom of choice and the participation of consumer interest groups.

BEUC feels that, in general, a more open discussion is necessary in which all parties of the market engage. Each party could give its specific view on the benefits and potential problems arising from the introduction and use of new technologies. This would combine the various pieces of the jigsaw into a single whole.

Quorn myco-protein: the development of a new food and its contribution to the diet

T. Sharp

Marlow Foods Ltd., Marlow, Bucks., UK

Background

Myco-protein is claimed to be the first new food for many years. It is produced and sold under the brand name Quorn by Marlow Foods Ltd., a UK-based company. It was introduced in 1985 to the UK, in 1991 to Belgium and in 1992 to the Netherlands and Germany.

The development and commercial production of this food is a highly significant landmark. It is the only one of a handful of projects on the production of multicellular and unicellular proteins to achieve commercialisation, and it shows the possibilities for the introduction and acceptance of a food that can contribute positively to our diet.

Dietary trends and the composition of Quorn

During the 1980s there has been a growing awareness of the role of diet in maintaining health and there have been concerns about particular components of our diet, such as fat, cholesterol and fibre. Official and unofficial reports have made their recommendations to improve people's eating habits and, albeit slowly, patterns of consumption are changing. The nutritional profile of Quorn myco-protein fits well with the principles of a more balanced diet (see Table 1), and it is pleasant to eat.

In 1984, the DHSS Committee on Medical Aspects of Food Policy (COMA)

Table 1. Nutritional value of Quorn myco-protein.

	Quorn	Milk	Egg	Beef	Chicken	Haricots
Energy (kJ/100 g)	357	273	617	937	622	391
Protein (% w/w)	12.3	3.3	12.3	30.9	24.8	6.6
Total fat (% w/w)	3.2	3.8	10.9	11.0	5.4	0.5
Saturated fat (% w/w)	0.6	2.3	3.4	4.6	1.8	0.1
Fibre (% w/w)	4.8	0	0	0	0	7.4

Source: R.A. McCance & E.M. Widdowson, The composition of foods, 4th ed. Special Report Series, Medical Research Council, 1978.

Table 2. Typical fatty acid composition of Quorn myco-protein.

Fatty acid	Content (% w/w)	
Palmitic acid	0.40	
Stearic acid	0.20	
Total saturated		0.60
Oleic acid	0.70	
Total mono-unsaturated		0.70
Linoleic acid	1.00	
Linolenic acid	0.30	
Total polyunsaturated		1.30

Source: Marlow Foods Ltd.

recommended a reduction in total and saturated fat intake. Since 1980 the proportion of energy from fat has decreased from 42.6% to 42.0%, still above the target value of 35%. However this must be viewed in the context of lower household consumption of fat and lower total energy intake. The ratio between polyunsaturated and saturated fats (P/S ratio) has risen from 0.24 in 1987 to 0.37 in 1988, the target being 0.45. Household consumption of red carcass meat has declined by over 25% since 1980 whilst poultry purchases have increased by over 20%. In the UK declining sales of meat are partly due to concerns about a high intake of animal fats, scares about the use of hormones and additives in production, as well as increasing prices.

The low fat content of Quorn myco-protein is seen as an advantage. The cells of the micro-fungus do not store fat because of their rapid growth, and the fat present comes mainly from the cell membranes. Being a plant food the content of saturated fat is low (0.6%) and Quorn is free of cholesterol (see Table 2). The product is therefore suitable for those on low-fat diets and for those who need to lower their intake of saturated fat in order to reduce their blood cholesterol level.

Table 3. Amino acid composition of Quorn myco-protein.

Amino acid	Content (% w/w)
Isoleucine	0.74
Leucine	1.25
Methionine + cystine	0.55
Phenylalanine + tyrosine	1.20
Threonine	0.72
Tryptophan	0.22
Valine	0.92

Source: Marlow Foods Ltd.

Quorn myco-protein also contains dietary fibre. With its fibre content of 4.8% it is comparable to other plant foods such as cereals, pulses and seeds. The types of fibre in Quorn are chitin and β-glucan cell wall material. The current average intake of fibre in the British diet is 20 g/day, the target being 30 g/day.

The protein level in Quorn compares well to eggs and some types of cheese, but is lower than in meat, fish and poultry. Unusually for a plant food, the protein is of high biological value and compares well with casein in milk. Other sources of nitrogen in the product are ribonucleic acid (RNA) and the chitin (*n*-acetylglucosamine).

The complete range of amino acids present in Quorn is shown in Table 3. The limiting amino acids are methionine and cystine whereas in the British diet it is threonine that is the limiting amino acid.

Digestibility, biological value and net protein utilization (NPU) of Quorn relative to casein have been determined in a group of subjects. Digestibility and NPU of Quorn are lower, but the biological value of Quorn is similar to that of casein (Table 4). The lower values may be due to the poor digestibility of cell walls although similar values have been obtained in other studies for yeast and algal proteins. These results show the dietary value of protein from this source.

Quorn myco-protein contains vitamins and minerals (Table 5) and provides most of

Table 4. Protein nutritive value of Quorn myco-protein and milk casein in young men.

Index	Myco-protein	Casein
Digestibility (%)	78	95
Biological value (%)	84	85
Net protein utilization (%)	65	80

Source: Towersey (British Patent).

Table 5. Vitamin and mineral contents of Quorn myco-protein.

Vitamin	Content (per 100 g)	Mineral	Content (per 100 g)
Thiamin (B-1)	36.0 mg	Phosphorus	240 mg
Riboflavin (B-2)	0.15 mg	Potassium	111 mg
Niacin (B-3)	0.30 mg	Magnesium	38 mg
Pantothenic acid (B-5)	0.14 mg	Calcium	21 mg
Vitamin B-6	2.0 µg	Zinc	7 mg
Vitamin B-12	0.25 µg	Sodium	240 mg
Biotin	9.0 µg	Iron	0.7 mg
Folate	7.5 µg		

Source: Marlow Foods Ltd.

the B vitamins. As regards the level of iron, Quorn lies between beef and chicken, but this iron is present in inorganic form and is hence less likely to be absorbed as readily as haem iron. Quorn is rich in zinc, which is particularly useful for vegetarians who need to maintain their zinc intake.

Development and production

Although micro-organisms have made a significant contribution to man's food throughout the ages, being used to produce yoghurt, cheese, wine and beer, it was not until the 1960s that their potential as a source of protein-rich foods in their own right was fully explored. Yeast was found to grow on *n*-alkanes and could be harvested for use as an animal feed supplement. Further studies investigated the use of yeast and bacteria for commercial applications. The research project to develop myco-protein was undertaken by Rank Hovis McDougall, a UK-based food company.

It commenced in 1964 amid a climate of interest in producing single-cell protein foods. From the onset the project was seen as a commercial venture rather than an object of basic research. A high priority was to develop a food with a pleasant eating quality and an enjoyable texture. Micro-fungi were investigated because of their nutritional and organoleptic properties. These organisms occur naturally in the soil, converting starch to protein. Over 3000 soil samples were collected form all over the world and, after careful screening, the organism *Fusarium graminearum* (Schwabe) was selected.

A key reason for selecting this organism was that its microfilaments are almost identical in size to meat fibrils. This resemblance confers a similar texture and eating quality and offers a significant improvement over the soya-based alternatives, which have larger fibres giving a coarser, more spongy texture.

In order to grow the organism efficiently on a large scale a continuous submerged culture fermentation process was developed. The fermentation runs last up to six weeks which gives major efficiency gains over batch processes. The organism is grown under sterile conditions in a 50 m^3 continuous-loop air-lift fermenter, and quality control checks are carried out at every stage of the process. Myco-protein is harvested continuously from this process and, at this stage, has a natural fibrous texture which is retained throughout further handling.

After harvesting the myco-protein is filtered under vacuum to remove excess water, leaving sheets that resemble slices of raw pastry. The myco-protein sheet is then mixed with egg albumen and vegetable seasonings to form a 'dough' which is shaped, cooked and cut into a variety of shapes and sizes for different uses. This product, Quorn myco-protein, is stored frozen before being sold to either producers of prepared meals or directly through supermarkets for use as an ingredient in home cooking.

Safety

The rapid growth of *Fusarium graminearum* derives from a high level of RNA. At too high a dietary RNA intake there is a danger of uric acid crystals being deposited in joints and soft tissues. In the production process excess RNA is removed by rapidly heating the fermenter broth. This has the effect of promoting enzymic degradation of the RNA, which is then lost by diffusion through the cell walls. This simple process reduces the RNA level in the product to a level well below the WHO target of 2%.

Before Quorn myco-protein could be marketed as a food product it underwent many trials for safety and toxicity. New scientific ground was broken in safety-testing a whole food rather than an additive and diets were specially formulated containing myco-protein as the only protein source up to 54% of total weight. Control diets contained casein and trials included teratogenicity, carcinogenicity, toxicity and multi-generation studies. Other studies looked at mineral balance, gastro-intestinal effects, oestrogenic effects and the effects of exposure to the eyes and skin during handling and production. There were no signs of toxicity, carcinogenicity or anti-nutritional factors (ANFs) in any trials.

Also as part of the trials to assure the regulatory authorities of the suitability for food use, myco-protein was subjected to tolerance studies at the Massachusetts Institute of Technology. More than 400 people were involved in the trials which were approved by the Food and Drugs Administration and other regulatory bodies. No adverse reactions were found – which was confirmed in a later UK trial with 4000 people and has subsequently been reinforced by broad trading experience with millions of consumers.

In 1978, the UK Government appointed a Committee under the auspices of the Ministry of Agriculture, Fisheries and Food to examine these data. In 1981, it gave unconditional approval for the sale of myco-protein and, in 1985, it was officially allowed to be put on the British market.

Commercial development

In 1985, Quorn myco-protein was first sold in a range of 'savoury pies' through J. Sainsbury, a leading British retailer. The product proved successful enough for the distribution to be widened. Over the next few years the product range, distribution and retailing greatly increased so, by the end of 1991, there were over 50 products containing Quorn as an ingredient, being sold through all leading UK retailers and many smaller outlets, including catering. The products include chilled and frozen ready-to-eat meals, pies and coated products as well as Quorn on its own as an ingredient for home cooking. This last product is also available in Belgium, the Netherlands and Germany where it is also proving to be of great value to the diet.

Since demand now exceeds supply a new production unit is under construction which should be operational by the end of 1993.

Research

The nutritional composition of the product offers consumers the opportunity to shift their balance of eating towards recommended targets. Regular consumption of Quorn reduces the intake of fat, saturated fat, cholesterol and energy and at the same time increases fibre intake.

As a food becomes widely consumed it is necessary to understand its impact on the diet and, if possible, its role in the prevention of diet-related disease. A continuous programme of nutritional analysis and independent clinical research has been developed to increase the knowledge base.

Studies at King's College, London, have shown that regular consumption of Quorn myco-protein significantly reduces blood LDL-cholesterol levels. Two papers on this issue have been published in the American Journal of Clinical Nutrition (Turbull et al., 1990, 1992).

The composition and digestibility of myco-protein fibre has been studied at the Dunn Nutrition Centre, Cambridge. The fibre fractions are mainly insoluble and are not digested, thus producing good bulk. A minor study on mineral availability has shown that myco-protein does not adversely affect absorption.

Recent work at Leeds University has shown that Quorn-based meals have a high satiety value compared to chicken. Because of the relatively low energy content of Quorn this finding may contribute significantly to weight maintenance and control. Further studies are in progress.

Concluding remark

The success of Quorn myco-protein to date is undoubtedly attributable to its acceptable eating characteristics, versatility and convenience. Consumers find it an enjoyable contribution to a better diet.

References

Turnbull WH, Leeds AR & Edwards DG, 1990. Effect of mycoprotein on blood lipids. Am J. Clin Nutr 52: 646-650.

Turnbull WH, Leeds AR & Edwards DG, 1992. Mycoprotein reduces blood lipids in free-living subjects. Am J Clin Nutr 55: 415-419.

Consumer behaviour and communication to the public

Nutrition education: the Norwegian experience

L. Johansson

National Nutrition Council, Norway

Introduction

The questions which I, as a representative of a national agency, find most important to discuss in relation to the theme of this Conference are:

- Which attitudes towards the diet do we want to create?
- Who is setting the agenda?
- How to identify resources and obstacles for nutrition education?
- How to stimulate objective information and proper cooperation with the different actors on the scene?

This paper will focus mainly on the contents of the message to the public, the importance of knowledge about the diet (nutritional surveillance) and cooperation with different actors.

Traditionally the diet of a population is strongly influenced by natural conditions and local food production. Demographic changes, increased migration, novel products and internationalization of food trade loosens up these bonds and influence our diet. These circumstances makes information about food and diet increasingly important.

Nutrition education can be provided in many ways. I do not wish to advocate any particular solution, but to share with you some of the experiences acquired over more than fifteen years of follow-up of Norwegian nutrition and food policy.

Norwegian nutrition and food policy

In Norway, as in many other industrialized countries, dietary habits are of significance for the high incidence of some common health complaints such as cardiovascular disease, certain types of cancer, high blood pressure and overweight. From 1950 to the 1960s, there was a dramatic increase in the incidence of myocardial infarction. Cardiovascular disease and cancer presently cause about 70% of all deaths in Norway. Coronary heart disease is the cause of 25% of total mortality in the age group 50–59.

At the same time as dietary habits and the disease picture of the population changed, a much better scientific documentation of the relationship between diet and health became available. This gradually resulted in the Government deciding in 1975 to define a national nutrition and food policy.

The policy document laid down clear goals with regard to the achievement of

dietary changes, as well as guidelines for measures to be taken to implement the policy. The nutritional goals of the policy were, and still are, to decrease the intake of fat, to increase the use of starchy food and dietary fibre, and to decrease sugar, salt and alcohol consumption.

Measures for implementation of the policy are directed both at the individual and at society as a whole. We shall use (a) health education to achieve a better understanding of the importance of taking care of one's own health and of the fact that the individual is able to do something about this, and (b) community measures which, as far as possible, create favourable conditions in the individual's environment.

The measures to be used, alone or in combination, may be classified as:

- agricultural and fisheries policy measures
- price policy and consumer subsidies
- measures in relation to industrial processing and imports
- measures in relation to marketing
- information and education
- provisions as to content and composition of food products
- research.

Although nutrition and food policy ranges widely, the effect on each field will be relatively limited. What is decisive for the implementation of a national nutrition and food policy will be the degree of stability and the extent of co-ordination with respect to its execution.

It is stressed that the changes in the diet should be effected by voluntary changes in eating habits. The task of the authorities is to stimulate and encourage the desired development in nutritional behaviour.

Another important principle is cooperation. The measures of the policy must be put into effect by collaboration between:

- the public sector
- the food industry
- the volunteers' organizations and
- the various categories of institutional caterers and households.

The National Nutrition Council (NNC), in collaboration with the Interministerial Coordinating Comittee in Nutrition, has been given the task of coordinating the implementation of the policy. The Council employs four administrative staff.

Nutrition education in Norway

Nutrition education is not very controversial and is an important measure in the follow-up of nutrition policy. The information work carried out by public institutions and organizations forms an important part of the overall information activities. The National Nutrition Council is responsible for ensuring that information work within the framework of nutrition policy is balanced and properly substantiated. Much of the information is provided by non-governmental organizations (NGOs). To strengthen contact between people working with nutrition-related matters, the Nutrition Council organizes meetings and conferences.

Since 1977, the Government has allocated more funds for actvities pertaining to information on diet and health. However, the annual 'information million' is small compared to the marketing resourses available to the food industry. The funds are administered by the Nutrition Council and largely used to stimulate activities at a local level.

Information work is mainly directed at and carried out through the following channels:

- NGOs and consumer organizations
- health workers
- schools
- policy makers
- journalists/media
- the general public.

Our largest single effort in nutrition education was from 1982 to 1986. Then the Nutrition Council implemented a national nutrition campaign in cooperation with NGOs and consumer organizations. The emphasis was placed on 'everyday food'. In the period 1990-1994, the National Association for Public Health, an NGO, together with the NNC and others, will implement a nation-wide campaign mainly based on activities at local level and with the focus on 'Enjoy your food'.

In recent years, the local Food Inspection Service and the public health service have played a more active role in nutrition work. Recently the Ministry of Health and Social Affairs has started the project 'Environmental Health'. The main purpose is to develop models for local health-promoting activities.

Nutrition education: general experience

In my opinion the two main goals for nutrition education are to create:
(1) health-promoting dietary habits
(2) a positive and relaxed attitude towards the diet
The methods and messages used to reach these goals have to be chosen on the basis of our knowledge of:

- factors influencing the dietary habits and
- the actual dietary habits in the population and selected groups
- priorities among the target groups
- priorities among those who finance the activities.

Dietary habits

Dietary habits are influenced by an interplay between many different factors at the individual and community level. I do not wish to go into detail but will just illustrate this complex situation with a simplifying figure. The figure also shows some important actors on the scene: industry, media, public services and the individual.

We still are far from having a more precise knowledge about how our dietary habits are formed. It is fair to say that this will vary among individuals, different

types of households and periods in life.

One common question is why not try to influence attitudes and ideology instead of knowledge. Personally, I do not like the idea of nutrition education or marketing aiming at changing habits by manipulating feelings, status, etc. , because this implies the creation of unconscious changes. I prefer to attempt to create a positive health consciousness, to make the necessary knowledge as easily available as possible and to make it easy to do healthy choices. In the long run nutrition education is a matter of confidence.

The message

The contents and the formulation of the message is of great importance. The fundament of nutrition education is the scientific documentation of the relation between diet and health. In Norway the nutritional recommendations are based on a Nordic expert report. It is very important to keep in mind that the recommendations are the general impression – the overall picture – of how we can compose a nutritionally optimal diet. These theoretical recommendations must be translated into practical dietary guidelines and practical advice.

The formulation of practical advice is also influenced by the priority given to the various diet-related health problems. Over the past 20 years we have focused on fat, specially satured fat, and on the question where we can find it.

Of great importance, and a relief to many, is that there are more ways of composing a healthy diet. There is no standard solution and an optimal diet will not be similar for Norway and Japan.

Nutrition education has tended to be far too theoretical. The NNC has tried to make the message as practical and positive as possible. Our experience makes us stress the following considerations in our information activities:

- Norwegian traditions must be taken into account
- Try to preserve beneficial aspect of the diet
- Give positive advice
- Stress everyday food and the most important food groups
- Only small changes are necessary
- Several weaknesses can be corrected simultaneously
- A healthy diet does not lead to extra expenses.

Another important issue is that advice, if possible, must be tailored to the reciever or the target group.

When you formulate the practical message it is also important to have in mind that the diet is not constant: it changes in time and there are differences across individuals and groups in the population. I will give some examples to illustrate this.

Table 1. Annual per capita consumption (kg) of various food groups in Norway, wholesale level. The 1990 data are provisional.

	1970	1975	1980	1985	1989	1990
Food product group						
Cereals incl. rice (flour)	71	75	80	74	80	79
Potatoes (not for industrial use)	81	71	60	63	52	53
Potatoes used to produce potato products	7	8	12	17	19	20
Vegetables	40	38	51	46	51	54
Fruit	68	74	75	85	80	79
Meat and offals	43	52	54	54	53	54
Eggs	10	9	11	13	11	11
Fish	40	26	34	4	40	40
Whole milk	172	169	164	124	66	59
Low-fat milk	–	–	–	28	79	84
Skimmed milk	14	26	28	30	33	32
Cream	6.8	6.7	7.1	6.8	6.9	7.0
Cheese	9	10	12	13	13	13
Butter	5.5	4.6	5.6	4.8	3.3	3.1
Margarine, total	19	18	16	14	13	13
Low-fat margarine				0.2	1.9	2.4
Oil and other fats	4.3	4.1	4.7	4.1	4.0	4.0
Sugar, syrup, honey and sugar products	42	32	43	42	41	41
Proportion of energy (%) derived from						
Fat	39	40	38	37	35	35
Protein	12	12	13	13	13	13
Carbohydrates	49	48	50	51	52	53

Source: National Nutrition Council (1991).

Changes

Since the introduction of nutrition policy in 1975, the consumption of cereals, vegetables, fruits, low-fat dairy products, cheese and meat have increased. There has been a reduction in consumption of margarine, butter and standard milk. The fat content of the diet has decreased from 40% to 35% calculated on a food energy basis (Table 1). The National Nutrition Council recommends a gradual decrease to 30 en% (% of total energy intake).

Since 1975, the contribution of margarine and dairy products to fat intake has significantly decreased. The amount of dietary fat originating from meat has not changed very much (Table 2). Average margarine consumption has decreased by 5 kg per year, and there has been a change to soft and light margarine. The consumption of standard fat milk (3.8 % fat) has decreased radically.

Table 2. Dietary sources of fat, wholesale level. Per capita daily consumption.

	1975	1985	1990
Total fat	129	123	111
Margarine	39	31	28
Oils, other fats	12	11	11
Dairy products	42	42	32
milk	18	15	11
cream	6	7	6
cheese	8	9	9
butter	10	11	6
Meat	21	21	20
Other foods	15	19	20

Source: National Nutrition Council (1991).

Table 3. Mortality per 100 000 per year due to coronary heart disease and sudden death of unknown origin among Norwegian men and women in different age groups.

	Age 40–49		Age 50–59		Age 60–69	
	M	F	M	F	M	F
1951–55	46.8	7.7	175.9	36.9	395.7	160.8
1961–65	96.3	13.7	349.6	62.6	861.1	281.0
1971–75	124.5	16.6	394.9	67.4	970.6	275.2
1981–85	89.0	10.5	355.2	60.7	894.7	234.1
1986–89	72.6	10.7	314.4	57.6	875.5	241.3
Decrease (%) since 1971–75	42	36	20	15	10	12

Source: Westlund, National Health Screening Service (1991).

Simultaneously, there has been a reduction in mortality from coronary heart disease (CHD). The prevalence of CHD had continued to increase up to the 1970s. In later years, however, mortality due to CHD declined both among men and women (Table 3). Surveys performed in several Norwegian counties show a decrease in serum cholesterol levels (Table 4). However there are large differences between different parts of Norway and different groups within the population, CHD mortality being higher among men with a low income and a lower education (Table 5). This shows that, although Norway is emphasizing equality in its social and economic policies,

Table 4. Serum cholesterol levels (mmol/l) in four Norwegian counties. Men and women aged 40–42 were studied in two surveys (1 and 2) three years apart in the period 1985-90.

County	Survey	Men	Women
Østfold	1	6.21	5.85
	2	5.91	5.55
Aust-Agder	1	6.05	5.72
	2	5.71	5.40
Sør-Trøndelag	1	6.11	5.79
	2	5.80	5.45
Vest-Agder	1	6.00	5.71
	2	5.76	5.38
Mean	1	6.11	5.78
	2	5.82	5.46

Source: National Health Screening Service (1991).

Table 5. Mortality from coronary heart disease (men aged 40–49, Norway) relative to the total population (= 100).

Years of education	Oslo (capital)	Sogn (western Norway)
7–9	136	70
10–12	109	40
>13	50	69

Source: Thürmer (1992).

much is left to be done before such socio-economic differences in mortality are eliminated.

Unfortunately, we do not know which groups of the population are responsible for the mentioned changes in the diet. However, we have done some minor surveys which indicate differences between the sexes and different social groups.

From 1979 to 1988, both men, women and children have implemented positive changes concerning their use of high-fat milk and of fat spread on bread for breakfast. The change is more pronounced in families with a high income (Table 6).

Low-fat milk has also gained popularity as a drink for school lunch. Prior to 1984,

Table 6. Use (%) of food items for breakfast in families with a low (L) and those with a high (H) income.

	Women		Men		Children	
	L	H	L	H	L	H
Use of high-fat milk						
1979	34	35	38	45	79	81
1988	21	15	19	16	50	31
No butter/margarine on bread						
1979	8	10	3	5	0	5
1988	14	20	3	18	9	28

Source: Norges Markedsdata.

standard milk was more or less the only type of milk used. Now low-fat milk (1.5% fat) accounts for 80% of school milk sales. Compared with some other countries, consumption of standard milk is low in school children in Norway. In the UK and Ireland, for instance, they mostly drink milk of the standard fat type.

To be able to improve nutrition education and the follow-up of the nutrition policy it would be of outmost importance to strengthen the nutritional surveillance system in Norway. In this connection I would like to mention that a Nordic working group, financed by the Nordic Council of Ministers, has evaluated existing data and made a proposal for a common surveillance system within the Nordic countries.

Attitudes

Existing knowledge, attitudes and interests among the population are also of importance for the formulation of the message. In the Norwegian population there has been a great potential for nutrition education for a long time. Most people say that it is a very important task for society to improve our dietary habits (Table 7). There is no difference between low and high income families. But it is a clear signal that more than half of the persons from low income families say that it is no idea to try to follow the advices from the experts, becauce they always change their opinion.

Fifteen years ago most people were of the opinion that diet has a large or very large impact on health and that high blood cholesterol levels cause coronary heart disease. The difference in opinion between low- and high-income families was small. However, practical knowledge was not impressing and in this respect we saw a difference between the income groups. Only half of those who said that polyunsaturated fatty acids were the best, correctly could identify if it is soft margarine or hard margarine and butter that gives polyunsaturated fats.

Table 7. Attitudes. Response (%) in Norway to some statements related to dietary knowledge.

	Low-income families	High-income families
There is a connection between diet and health	73	79
Too much cholesterol in the blood causes coronary heart disease	70	77
Which fatty acids are the best:		
No idea	46	36
Polyunsaturated	38	47
One of the most important tasks for society is to promote better dietary habits	79	78
It is of no use to follow experts' advice: they change all the time	55	39

Source: Marketing Link (1976), Norges markedsdata (1984).

Methods

I prefer to classify the various nutrition education activities into general and group oriented activities. These can be initiated both on a central and a local level.

General activities like 'Eat healthy' campaigns can be launched both on a national and a community level, and so can targeted measures such as lunch programmes at school or on the working place. Targeted activties on a local level such as lunch programmes have the advantage that you can inspire through practical demonstrations and experience.

I suppose that personal advice, when you can adjust your counselling to the actual habits and problems of individuals, is the most effective way. The Norwegian Health Screening Services have shown that counselling performed by health personell caused a significant and similar decrease in serum cholesterol both among those with shorter and longer education.

Marketing studies has shown that most people claim to obtain their information about diet and nutrition from radio/TV, weekly magazines, at school, in pamphlets and, to a lesser extent, to health personnel (Table 8).

Public information through television gets the higest ranking and information through voluntary organizations (NGOs) the lowest (Table 9).

In the past fifteen years we have used many different nutrition education activities such as campaigns, books, pamphlets, TV and radio spots, advertisements and cooperation with other organizations, both on a central and on a local level. One serious drawback is that just a few projects have been evaluated. The surveys we have completed show differences between men and women. In general, women are more interested and positive towards our material.

To be able to develop nutrition education we have to use more resources to help us evaluate our activities so that we can learn which methods to use in certain conditions.

Table 8. Sources of knowledge about nutrition and diet, Norway (% of total responses).

TV	51
Weekly magazines	31
School	30
Pamphlets	25
Advertisements	22
Friends	16
Health personnel	14
Books	2

Source: Marketing Link (1980).

Table 9. Ranking of information sources (1 = highest, 7= lowest).

Information through	Score
TV	2.1
Newspapers/magazines	2.8
School	3.8
Books/pamphlets	4.6
Health personnel	4.6
NGOs	6.0

Source: Marketing Link (1984).

Cooperation on a national level: the food industry as an example

An institution like the National Nutrition Council (NNC) tries to reach the individuals both directly and indirectly through mediators. We try to influence the most important actors at the scene. It is also important to identify factors and actors that can be resources or obstacles to the work. I will just mention food industry as an example. In discussing the role of industry, the following aspects must be kept in mind:

- The food industry and the market have quite some conflicting interests. The industry must sell its products to survive, and this leads to competition for market shares.
- The food industry can influence both supply and demand through marketing and product development.
- The food industry has know-how and resources in abundance.

Last year in Norway, some 0.3 million USD were allocated from public funds for nutritional and dietary information. This compares poorly with the 20 million USD spent by organizations marketing agricultural produce. The amount spent by the food industry as a whole was 200 million USD, or 400 times more than the amount allocated on nutrition information in the state budget.

The 'above the line' marketing activities, such as advertisements in magazines and television spots, have almost doubled in the past three years (40 million USD in 1989 vs. 70 million USD in 1991). The most frequently used media are television (30%), newspapers (28%) and weekly magazines (22%). The use of television will increase in the future.

The Swedish scientist Ola Feurst collected food advertisements from 30 popular Swedish magazines issued in the period 1950–1985. The advertisements, which met the size criterion of at least one-third of a page, were sampled from each magazine. Of the 3240 advertisements sampled, 737 pertained to food. These food advertisements contained a total of 3623 defined sales arguments. Most of the advertisements (59 %) promoted luxury foods like coffee, candy, soft drinks and pastries. However, basic foods took most of the adversising expenses (70 %).

Based on a categorization of the advertisements as to the content of the statements, Feurst found that the most used promotional arguments were emotional qualities and convenience. Nutritional value was not so common (Table 10). However, the use of health-related messages increased from 17 % in the 1950s to 26 % in the end of the period under investigation.

As regards the Norwegian meat industry, a very important trend is that emphasis is now being placed in advertising on low fat content as a desirable quality characteristic. We hope that the dairy industry will follow this example and promote their low-fat products with the same devotion as for their high-fat products.

The following example will serve to illustrate the meaningfulness of an interplay between the food industry and the local food control authorities. In 1986, one of the 82 municipal food control authorities in Norway analysed the salt content in bread supplied by bakeries in the district. The bakers were subsequently informed that it would be favourable if they reduced the amount of salt added to the dough. Further samples were analysed six months later. After two years, the average salt content in bread had decreased from 1.6% to 1%. This initiative then gradually spread to other parts of the country.

Table 10. Food advertisements (% of total), Sweden, 1950–85.

Commodities promoted	
Basic food	41
'Junk food'	59
Promotional arguments	
Emotional qualities	52
Convenience	26
Nutritional value	18
Harmlessness	4

Source: Feurst (1991).

It is essential that the industry's technological and promotional know-how is used as best as possible to promote the health of the consumer, not make it worse. The Nutrition Council tries to achieve this through regular contacts and cooperation with the industry. In this connection I also would like to emphasize the importance of the pedagogy of price policy and product development.

Nordic cooperation

Since 1983 we have had a Nordic working group on nutrition education, financed by the Nordic Council of Ministers, which has arranged Nordic seminars for exchange of experience between those who are engaged in nutrition education. During the past decade many nutrition education activities have been implemented in Scandinavia, both on a national and a local level. National campaigns are now going on in Denmark, Iceland, Norway and Sweden.

During its most recent meeting the Nordic group tried to identify some common problems and tasks for future work.

One common denominator is the lack of evaluation and documentation of the projects executed so far. It is difficult to obtain information about the projects because they often do not result in reports in scientific journals. Another common experience is the problems encountered when trying to reach groups with short-lasting education.

To improve the methods for nutrition education the Nordic group has decided to give priority to the following projects.

1. Create an information bank on nutrition education (Denmark).
2. Investigate the possibilities to improve the cooperation between mass media and nutrition educators(Finland).
3. Problems concerning evaluation (Norway).
4. Review experiences obtained in target group analysis and efforts done to reach those groups in the population which are difficult to reach (Sweden).
5. Arrange a satellite symposium in connection with the 5th Nordic congress on nutrition in Iceland, 14–17 June 1992 (Iceland).

Another Nordic working group has tried since 1987 to stimulate scientists in social science to work with problems related to food and consumption. In 1990, this group organized a symposium 'Food, Symbols and Everyday Life' and published the anthology 'Palatable Worlds – Sociocultural Food Studies'. In September 1992 this working group will organize, in Denmark, the second Nordic symposium on sociological food research: 'The Politics of Food and Nutrition'.

Conclusions

All the time nutrition education and the message must be influenced by our main objectives. We must consider the following aspects.

1. It is the whole diet and its overall nutritional composition that is most important. This makes it difficult to give detailed advice on specific food items or brands.

2. We must not overemphasize 'new' scientific 'evidence' in practical information. We should not spend too much time, I think, on exposing false messages but rather give priority to practical health-promoting messages.
3. A consistent message given over long period of time will have greater possibilities to reach all groups of the population. If we should correct anything, I believe that it is the impression that the experts keep changing their mind all the time.

We also have to bear in mind that food and eating have an important cultural and social function. To most people, I think, enough and palatable food is much more important than healthy food.

As food and eating is an important element in everyday life the emotional attitude towards food and eating is of great importance (negative and anxious or positive and relaxed).

Nutrition and health education, well intentioned as it may be, can evoke a fixation on body image and life-style that is not healthy. The increased incidence of eating disorders possibly reflects this unintentional effect. In the past decade we focused on contamination of foods with toxins and hormones which gave rise to anxiety. In my opinion, in the long run we ought to try to stimulate to a positive attitude to the diet.

To be able to improve nutrition education and nutrition policy we have to strengthen our nutritional surveillance system and the evaluation of our activities. At the same time as we try to improve nutrition education it is important that we cooperate to contribute to the creation of a favourable general environment, which supports and promotes public health by allowing and encouraging the consumer to make healthy food choices.

Towards implementing food and nutrition policy

D.A. Booth

Nutritional Psychology Research Group, School of Psychology, University of Birmingham, UK

Introduction

This Conference has been called to evaluate how policies on food and nutrition can be implemented in Europe. However, the formulations of policy supported by the WHO-Europe report and governments in European countries are not implementable as they stand. In the USA, the National Research Council has had great problems deciding strategies for implementation, despite intensive review of the evidence for their recommendations on diet, chronic diseases and health (NRC, 1989). Other evidence is needed as to which interventions actually will protect and promote nutritional well-being within such industrialised countries. Then there will be a scientific basis for this part of a global plan of action on diet-related problems.

Guidelines in terms of habitual nutrient intakes averaged across populations, as also recommendations to control body weight and take exercise, provide only broad directions along which to seek to formulate justifiable and efficacious policy implementations. An implementable food and nutrition policy is a scientifically up-to-date and concretely operational specification of public activities that actually do widen the uses of foods and drinks in those patterns for which the evidence is adequate that they will help to prevent disease and promote positive health.

The theme 'Consumer behaviour and communication to the public', therefore, must not be confined to attempts to communicate to the public about nutrient intake change. Promotion of nutrition requires the identification of dietary behaviour that actually does reduce risks to health and the summative evaluation of the collaboration among commercial and public enterprises intended to support and encourage such behaviour among members of the public exposed to those risks.

Obesity is arguably the largest public health problem in Europe faced by food and nutrition policy. Yet obesity is the health problem which every member of the public could do the most to prevent, if the environment was engineered to permit genuine choices among eating acts and physical activities. Instead, social structures do not provide real opportunities to avoid obesity and so genes disposing to weight gain have full expression.

This paper will present evidence that the greatest contribution to the prevention of obesity in England would come from industrial, regulatory, educational and informal

support for the habit of avoiding energy in and with drinks between meals, coupled with less fat within meals.

Nutrient targets don't work – wisely timed eating does

Effects thus far

On advice from medical and food experts, governments have sought to see current policy implemented by, for example, requiring information on nutrient contents to be attached to foods and encouraging the media, schools and health services to give dietary advice in terms of foods and menus that might contribute to the recommended average daily nutrient intakes. It is now increasingly realised that such strategies are insufficient, are often ineffective and even in certain respects can be counter-productive.

Fat intake is not going down appreciably in most parts of western Europe, despite greatly increased sales of low-fat foods. The reduction in cardiovascular fatalities after treatments lowering plasma cholesterol may be compensated by a rise in non-disease-related mortality. Salt and sugar intakes have gone down little if at all from the levels they had already reached when recommendations were made in the early 1980s. Despite the policy of advising control of weight in a context where there is already intense social pressure to be slimmer than might be desirable for health, the prevalence of obesity is high and increasing in some European countries and is associated with diet-related health risk factors in all parts of Europe (Seidell, 1991).

Roots of the problem

This absence of effective public health strategies for diet is seen in many quarters as a political problem. That obscures its scientific aspects.

There are undoubtedly vested economic and professional interests that actively resist or inertially obstruct what many citizens could want to do with their diet that might help to prevent chronic diseases. The food business is criticised for the ethics of selling fatty, sugary and salty products. Yet health professionals have advocated expensive and ineffective diet products. The medical profession is criticised for disregarding the patient's commitment to values in addition to health. Yet commercial enterprises exploit the health angle on their product or service without regard to actual benefit or lack of it to most of the customers.

One of the worst ethical failures, though, is on both sides – health and food – and in their advice to and lobbying of governments. This weakness derives from educational and professional fragmentation but has its moral implications. There has been an almost complete neglect of the scientific technicalities of identifying actually healthier uses of foods and effective means of promoting them within the cultural and economic realities of everyday life. Neither food marketing research nor nutritional research has at the centre of their investigations the contemporary behavioural sciences, such as cognitive psychology. Yet without the workings of individual

consumers' conscious and non-conscious mental processes in the organisation of their behaviour towards food, there would be neither any sales of food products nor any physiological effects of their consumption (Booth, 1988a, 1989a, b). (It has to be added that few psychologists have shown interest in the applications of their science to food perception or eating motivation and physiology).

What would a solution look like?

What consumers need for the sake of their long-term health is advice and support that is not adequately specified by guidelines on nutrient intakes and body weight. The effective implementation of a broad food and nutrition policy requires the development of scientific understanding of causes of diseases that individuals can modify for themselves within culturally, technologically, ecologically and economically attainable environments.

Neither the stated policy nor its research base has identified dietary health-risk factors in a efficaciously implementable manner. We do not know what the risk factors are in terms that can be communicated to the public or to professionals in food, health or education services. We do not have the technical specifications for the design of foods, of food services and of leisure, work and home facilities that would support healthier eating and exercise habits in those whose health protection requires such behaviour.

Thus, existing food and nutrition policy provides a broad framework for action but that action should not continue to be attempts at implementation based purely on the translation of nutrient intake guidelines into advice on choices among foods and the regulation of information on the nutrient contents of foods. The action required is the development of behavioural and socio-economic details of effective policy within the agreed broad areas of nutritional change.

Workable strategies of implementation must be integral to the policy. The policy therefore needs to be behaviourally specific, culturally practicable and ethically unprejudicial. Implementable policy must alo be capable of continuous, rapid and smooth adaptation to growth in scientific understanding of dietary risks to health and of ways to enable changes in behaviour that are likely to reduce disease incidence.

Ways forward

So one need not doubt the merits of preventing obesity, of reducing fat intake, while replacing needed energy by complex carbohydrates, and of increasing intakes of fruit and vegetables, for example. Nevertheless, the food production, manufacturing, service and retailing industries and health and education professionals need to be able to respond to continually improving differentiation in the evidence coming to light within these broad themes on potentially risky dietary habits as that behaviour is perceived by consumers.

Regarding fat intake, for example, regulation of food design and marketing and public dicussion should not inhibit the encouragement of eating habits that tend to

displace the cholesterol-raising saturated fatty acids by other saturates, by mono-unsaturates and by those polyunsaturates that are more clearly protective. Also, the focus on cardiovascular prevention should probably be on patterning of fat intake, rather than any and all contributions to total fat intake, i.e. on avoiding the fattiest meals (most liable to exceed atherogenic 'threshold') and any fat between meals (the most fattening timing).

Similarly, the threshold effects in salt-sensitive hypertension make high-salt eating occasions important, not just day-long salt intake. Daily sugar intake may not matter at all so long as the sugar consumption is kept away from the ends of eating occasions and from drinking occasions between meals by those at risk of obesity or dental caries and those with diabetes, particularly those who eat plenty of complex carbohydrates too. Alcohol also may well be most fattening between meals and after the last meal of the day: the 'percentage of daily energy' guideline is even less usable than the limits in terms of weekly units of alcohol.

The recommendation to control weight within the desirable range provides no guidance as to how that might be achieved. The mathematical implication of the thermodynamics of weight control, simply to count calories, is psychologically impossible for most people, even if it were sufficiently reliable for computerised nutritionists to succeed in doing it! The translation of the weight-control guideline by health professionals to individual members of the public, slimming groups and the media obviously has had no general effect up till now. For many people, it may have added extra emotional twists to the vicious spiral of 'dieting makes you fat'.

To provide a scientific basis for efforts to reduce the prevalence of obesity, research is needed within each major sub-culture and life-style to identify in consumers' own terms those habits in ordinary life that are the most fattening and the most feasible alternative behaviour that can be supported by commerce and the public services. In England the most prevalent fattening habit is probably the consumption of any source of energy in and with drinks consumed during work-breaks and on social occasions between or after meals or snacks (Blair et al., 1989; Lewis et al., 1992). Those at risk from overweight need to be enabled to confine habitual between-meal ingestion to zero-calorie hot or cold brews or extracts, with cole slaw being the sort of material from which any accompanying nibbles (or pleasurable alternative sources of water and stimulation of saliva) should be developed (Booth, 1988b).

Dietary behaviour and heart disease

To illustrate the potential from bringing psychology to the centre of food and nutrition policy formulation as well as implementation, two of the above points are expanded briefly in conclusion.

How can cholesterol screening reduce total mortality?

In the UK at least, average total fat intake has not been substantially reduced by years of nutrition education on dangers to the heart and increased consumption of foods

labelled 'low-fat' in accord with food regulations set up as recommended in medical advice on food policy. Now that plasma cholesterol analyses are more readily obtainable, some of the dietary health promotion effort has returned to the clinic. As part of their health promotion contracts, primary health care teams are screening patients for hypercholesterolaemia.

However, there is widespread concern at the reports that the reduction of cardiovascular mortality after successful dietary or pharmaceutical lowering of high plasma cholesterol levels is roughly equalled by an excess of deaths by accident, suicide and murder. The interpretation generally placed on this possibility is that plasma cholesterol could have neural actions and its lowering might give rise to aggressiveness. However, a much more obvious possibility has been neglected. This is a purely cognitive mechanism.

The mortalitt in cholesterol reduction trials is very low. Therefore, an increase in non-disease-related mortality could arise from an extreme pattern in a very small minority. It is entirely possible, for example, that communication of a diagnosis of this cardiovascular risk factor, even coupled with feedback as to subsequent success at reducing cholesterol level, causes a small proportion of patients to label themselves as liable to heart disease in a way that reduces the value they place on their own life. Such a bad reaction to the diagnosis, despite successful treatment, could increase accident-proneness or intensify any disposition to react suicidally or to expose oneself to risks of fatal accident or attack. This common-sense psychological possibility should be investigated by carefully designed monitoring of appropriate measurements of attitude and personality during cholesterol screening programmes.

This clinical example exposes the importance for public health intervention of having regard to the values and affect surrounding eating behaviour relevant to health. It would be most unfortunate if worries about high fat intake, for example, were created among the general public in a manner that changed the attitudes of some in a way that exposed them to extra risks, even though they and others might thereby also reduce risks from excessive fat consumption. Also, more broadly, it is ethically questionable whether a life of worry and misery about one's diet should be assumed by policy to be preferable for most people to some risk of illness or a shorter life by some years. This point is not the same as advocating a holistic approach to health promotion, for example involving stress reduction or relaxation strategies; nevertheless, attention to the psychology of disease-preventive nutrition promotion could well interact productively with approaches having non-physical objectives.

How can weight be reduced permanently?

Obesity is arguably the largest public health problem in Europe faced by food and nutrition policy. Yet this is one of the health risks that members of the public could do the most for themselves to prevent, if the environment was engineered to permit genuine choices among eating acts and physical activities.

Instead, current social structures do not provide real opportunities to avoid obesity and so genes disposing to weight gain have full expression. Contrary to contemporary

political and public-service ideologies, it is a psychological fact that effective communication of information does not enable freedom of choice unless alternative actions are available that are compatible with the individual's balance of values and patterns of involuntary reactions to the situation of decision. Furthermore, diets do not slim: no dietetic, pharmaceutical or psychological prescription or commercial product or service has been shown to be generally reliable at delivering weight loss maintained in the long term.

Our evidence from England (Booth et al., 1991) is that the greatest contributions to the prevention of obesity would come from industrial, regulatory, educational and informal support focused on the habit of avoiding energy in and with drinks between meals, coupled with smaller desserts and less fat within meals, more exercise in and out of the office, consistent boosting of larger-sized people's confidence in their physical appearance and in their ability to keep unhealthy overweight off if and when they so chose, and the training of skills in self-management of negative affect and in finding alternatives to energy consumption (and smoking) when emotionally wrought.

Thus, there is little if any point in telling people to lose weight who do not yet want to or do not believe that they can. For service efficiency and efficacy as well as for ethical reasons, professionals and policy should assiduously avoid allying health motivation with low self-esteem about bodily shape and eating habits (Lewis et al., 1992). Emotional eating, habitual loss of control of eating and labelling the occasional lapse as personal failure all have to be addressed for those in whom they are interfering with weight-loss maintenance. All counsellors in weight control need to be able to recognise psychiatrically diagnosable emotional disorder and have available psychological or medical consultants to whom such apparent sufferers can be referred. That is, permanent weight reduction (like reduction of total mortality by cholesterol screening) requires health professionals to attend to the behavioural effect and experiential meaning of their interventions.

The UK Government has thus far not supported its Health Education Authority's interest in determining what action might be taken to reduce the prevalence of obesity in Britain. However, interest in a concerted action on the prevention of obesity has been declared to the Biomedical and Health Research Programme of the CEC. The proposal would be to extend the methodology of identifying the most fattening habitual behaviour and the feasible less fattening alternatives in different cultures around the Community and the wider Europe.

References

Blair AJ, Booth DA, Lewis VJ & Wainwright CJ, 1989. The relative success of official and informal weight reduction techniques: retrospective correlational evidence.Psychol Health 3: 195-206.

Booth DA, 1988a. Relationships of diet to health: the behavioral research gaps. In: Manley CH & Morse RE (Eds). Healthy eating – a scientific perspective, pp. 39-76. Allured, Wheaton, IL.

Booth DA, 1988b. Mechanisms from models - actual effects from real life: the zero-calorie

drink-break option. In: Booth DA, Rodin J & Blackburn GL (Eds). Sweeteners, appetite and obesity, pp. 94-102. Academic Press, London.

Booth DA, 1989a. Effective habit messages and food marketing to prevent obesity. In: Haenel H, Neumann J & Voss P (Eds.). Promotion of healthy nutrition as part of lifestyles conducive to health, pp. 81-87. German Hygiene Museum/WHO Collaborating Centre, Dresden, FRG.

Booth DA, 1989b. Health-responsible food marketing. Brit Food J 91 (6): 7-14.

Booth DA, Blair AJ, Conner MT & Lewis VJ, 1991. Sensory recognition of foods and the development and prevention of obesity. In: Oomura Y, Tarui S, Inoue S & Shimazu T (Eds.). Progress in obesity research 1990, pp. 47-51. John Libbey, London.

Lewis VJ, Blair AJ, Booth DA, 1992. Outcome of group therapy for body-image emotionality and weight-control self-efficacy. Behav Psychother 20: 155-166.

NRC, 1989. Diet and health. National Academy Press, Washington DC.

Seidell JC, 1991. Obesity in Europe – some epidemiological observations. In: Ailhaud G et al. (Eds.). Obesity in Europe 1991, pp. 109-112. John Libbey, London.

Effective communications with the consumer

J. Brown

Burson-Marsteller Public Relations, London, UK

The two broad consumer communications tools are advertising and public relations (PR). Both involve a range of specialist skills and in the hands of experienced practitioners are highly effective in changing knowledge, attitude and behaviour among consumers. Advertising is an easy term to understand but PR tends to be poorly understood. At the outset that PR covers all forms of communication other than advertising. The modern PR practitioner uses dozens of channels of communication, mostly indirect, in order to alter consumer thinking and behaviour. Not surprisingly, it encompasses many specialist sub-sections such as medical PR and policy PR.

Professional communicators working in the commercial sector would normally begin with a WHO, WHAT, WHAT analysis when considering any task: WHO are we talking to (i.e. target audience), WHAT do they think/do now, and WHAT do we want them to think/do in future. This sounds simple but it is surprising how much health education has been conducted without clear target audience definition or sufficient knowledge of the current position.

In terms of communicating nutrition policy and achieving behaviour change in line with policy, the task is akin to political work because a good deal of persuasion is needed to overcome resistance to fundamental change. Unlike many instances of commercial communication you have not followed the path:

1. Research what people want
2. Produce a product to meet these needs/desires
3. Market and sell the product.

Instead, the path is:

1. Research what people should do
2. Form this into a policy
3. Market the policy

Clearly this is a more difficult task.

Returning to fundamentals, the first thing to do is define target audiences. For health education these would fall into two categories:

Direct	Indirect
Consumers themselves	Medical professionals
split into sub-groups	Paramedical professionals
Teachers	
Media	
'Endorsers'	

The indirect targets act as conduits of communication to the ultimate targets, the consumers themselves. In general, PR most often involves this indirect route whilst the direct route is the principal province of advertising. Both should be employed and be coordinated with the ultimate target in mind.

Consumer sub-divisions

Consumers are often sub-divided by income, occupation group or neighbourhood. However, a proprietary research system with considerable advantages over these forms of sub-division, which has been developed by my company to assist our clients, is based on goals ('what you want'), motivations ('why you want it') and values ('what you get from it') and is known as the 4Cs system – Cross-Cultural Consumer Characterisations.

The three fundamental elements (goals, motivations, values) determine a wide range of choices, whether it is the choice of career, spouse, type of car, type of diet or brand of breakfast cereal.

There are at least seven types of consumers in the population. Each type has its characteristic goals, motivations and values. These seven types are clustered into three main normative segments of society. The types and segments can be defined as follows:

Type	Goal	Motivation	Value
The Constrained			
* Resigned poor	Survival	Given up	Subsistence
* Struggling poor	Improvement	Escape from hardship	Hope and luck
The Middle Majority			
* Mainstreamers	Security	Conformity Family responsibility	Social acceptability
* Aspirers	Be perceived as successful	Envy	Status
* Succeeders	Material success Be in control	Achievement	Recognition
The Innovators			
* Transitionals	Self-identity	Rebellion Self-confidence	Self-satisfaction Self-esteem
* Reformers	Social betterment	Social conscience Moral certitude	Social altruism

It will be clear from the descriptions of the categories that the system has great relevance to nutrition messages. By understanding the types of people we are to educate, we can be clear about what the important things are *from their perspective* and how best to reach them.

If we then examine where any particular message sits in terms of acceptance and behaviour change, we can sensibly plan our communications. This is because there is a characteristic 'adoption curve' whereby new information and behaviour tend to move through the population beginning with the groups which comprise innovators and succeeders. We can also tailor a series of communications aimed at different segments. Furthermore, it provides insight into national differences because the size of the types in the population differs; for example, there are far more innovators (30% of the population) in Norway than in western Germany (12%). This has an important bearing on the way we might communicate *the same message* in the two countries. As Europe harmonises and ever greater interchange between countries occurs, we will see a reduction in national cultural differences but we will never see an end to the sort of groups and segments described in this paper. One of the strengths of the 4Cs system is that it works across cultures. 'The people' will never become homogenéous whether within one country or across a continent.

In terms of message content, we tend to place too much (in some cases almost total) emphasis on rational benefit. I suspect that this is because the scientists, doctors and policy-makers who create 'the product' are driven by a rational, scientific model. In commercial terms, this is like selling a product solely on attributes with no deeper sense of personal value.

Using the indirect routes

Once you understand your consumers, know what they think and do now and what you want them to think and do in future, you can chose appropriate indirect channels of communication for each consumer group. The most diverse channel and, in many ways, the most powerful one is the media. Here you can target very specifically. Similarly, the endorsers you use can be appropriately matched. For example, for a mainstreamer ultimate audience, you may want to use a rather traditional and 'safe' endorser such as a well respected doctor or professor in a conservative medium such as a well established, not over-dramatic, documentary TV series. By contrast, for an aspirer ultimate audience, the same basic messages would be better endorsed by a fashionable, perhaps even controversial, sports personality via a rather more racy medium such as a trendy TV life-style series or fashion magazine.

Happily, there will be a general tendency for individuals to screen themselves off from indirect communications not tailored to their needs; the mainstreamer simply would not watch a raucous trendy TV life-style show.

Unfortunately, all too often one sees the same 'safe' and conservative endorsers with the same rational attribute based messages in as many different media as will allow them space. Not only is this inefficient but it also conveys a single 'lowest common denominator' image which actually puts people off changing behaviour.

Image and packaging are as important as substance when it comes to policy as any politician will tell you if he or she is honest. The politician is constrained from using media and endorsers as creatively as I have suggested because the message is so bound up with the individuals espousing it that the style of communication reflects back on them. However, with nutritional messages, we have a lot more freedom if we are prepared to use it.

A precedent has been set by health education related to HIV and AIDS. New ground has been broken in targeting both PR and advertising to different groups with different media. For example, outspoken gay celebrities have been used as endorsers and carriers of health education messages in homosexual newspapers and magazines to good effect. These endorsers are not used in other media where different figure-heads are more effective. This type of targeting and planned effort to meet the needs of differing segments of the population is vital if the limited funds available for health education are to be spent more effectively.

Within the field of nutrition education the most that educators have tended to do in terms of consumer segmentation PR has been the use of 'middle-of-the-road' celebrities in mainstream media. The gap between practice and expectation is widening in a world where consumers and key opinion-formers are now used to the sophisticated approach of commercial PR.

The fact that the commercial sector has developed marketing skills for ideas as well as products has relevance for public policy educators. As sponsorship and endorsement deals have proliferated, the emphasis has been on an exchange of money (which the educators need to fund further initiatives) for credibility (which the food industry needs to provide enhanced consumer appeal) but I would like to suggest that the educators could gain more by tapping into commercial marketing skills and the industry could gain more from a deeper partnership with policy makers and educators. Furthermore, products with a relatively small market but a high penetration of population segments which are being targeted should be considered for educational tie-up deals as well as major brands (which tend to have the greatest identification with mainstreamers). We must think in terms of getting our messages into a series of life-styles rather than to 'the people'. We must recognise that the population is a very heterogeneous mixture and that the sub-divisions are now specifically catered to in both product and communications terms. Modern technology has brought about an explosion of channels of communication. For example, in the UK alone there are over 7000 magazine titles on sale and cable TV is bringing many more channels. Truly we are entering the era of narrowcasting rather than broadcasting. These developments must be reflected in public education techniques, and if this occurs we can look forward to much more effective communication of information and motivation to change behaviour.

Behaviours towards the consumption of wines and alcohols in France

J.L. Lambert

Ecole Nationale d'Ingénieurs des Techniques des Industries Agricoles et Alimentaires (ENITIAA), Nantes, France

Introduction

For many centuries, French wines have had a worldwide reputation and thus French people have become famous for their high wine consumption. It is still true that the average consumption of wine among French people is one of the highest in the world, but this assessment hides contradictory consumption behaviours, which illustrates quite well an important evolution over the past fifteen years.

The data presented come from a large survey carried out in 1990 on a sample of 4000 adults (Aigrain et al., 1991a, 1991b). This survey was conducted in collaboration with the Centre Interdisciplinaire d'Etude de la Vigne et du Vin (Lambert, 1990). For general information on French behaviours towards food consumption the reader is referred to Lambert (1987).

Those who drink red wine with daily meals

As in other Latin countries that produce wine, red wine is still part of daily meals of French people. Wine and meals belong to the same culture and almost 90% of wine is consumed during the meals, whereas 50% of beer is consumed away from the table. Therefore, one of every four French adults is used to drinking wine every day and consumes about 250 litres per year. Those 'heavy drinkers' are mainly rather old men, among which two-thirds come from the working class (workers, farmers). On top of their regular wine consumption at home, most of them often go to pubs where they also drink wine. Thus, this group of French people includes more than half of the people who consume more than 200 litres of wine and more than 35 litres of pure alcohol per year.

The traditional gourmets who drink wine almost everyday

About 5% of French people have similar habits but do not always drink wine with ordinary meals, in particular with the meals taken at work. This group is close to the former one (for 37%), with 18% of older men from the upper class and 13% of young men from the middle class.

Their behaviours reflect the French traditional gastronomic culture and this is even more obvious during the festive meals (Sunday lunches included), when there is

almost always a bottle of 'good wine' on the table. Besides, the youngest people of this group usually only drink wine with meals of this kind, and particularly when there are guests. However since these meals are frequent, they drink wine almost every day. Although they are able to consume various beverages, they are bound to eat regularly at the restaurant because of their jobs and therefore easily drink wine, especially if the occasions are business meals.

Among the older people from the upper class of this group, there are 10% who consume more than 200 litres wine per year and 9% who consume more than 35 litres alcohol per year. Among the young from the middle class, 8% consume more than 200 litres wine per year and 12% consume more than 35 litres alcohol per year. These people also drink other alcoholic beverages such as beer and spirits.

Those who drink on Sundays and on festive days

Most French people (40%) behave as the young people of the former group (those who consume wine nearly every day). The frequency of festive meals is the main difference between this group and the former one. However, their true motivation is the same: they 'save themselves for the right moment'.

This group comprises 30% of the young people from the middle class and 25% of the older persons from the upper class. Therefore, we miss in this category the working class which can be explaine by the fact that working class people receive less frequently invitations and most festive meals are taken with the family. Moreover, while it was mainly male drinkers we talked about in the previous category, we can now include female drinkers among 'the festive-day drinkers'.

Those who have wine daily drink 171 litres per year whereas the 'Sunday drinkers' only drink 53 litres per year.

Those who never drink wine

Finally, it is important to say that almost a third of all French adults hardly ever drink wine. About 20% of them are former wine drinkers who have stopped drinking for health reasons, for medical reasons or because they were afraid of their friends and family's drinking habits. This 'former drinkers' group is much like the 'heavy drinkers' group (old men from the working class) but they have an even lower average income.

Those who claim never to have drunk wine can be classified as follows:

- people who do not like the taste of wine or of alcohol (two-thirds of this category)
- people who worry about their health (28%)
- people who do not drink wine for moral or religious reasons.

The first two subgroups are mainly young people (for more than 50%), men as well as women.

Is the North European model going to replace the Latin one?

A comparison between the results given by the surveys made between 1980 and 1990 (see Table 1 and Fig. 1) allows us to give more details about the recent evolution of

Table 1. Evolution of wine and alcohol drinking behaviour in France.

Type of behaviour	Annual wine consumption (litres)		Proportion of population (%)					Social groups overrepresented (proportion)[1]
			>14 yr old		whole population			
	1980	1990	1980	1990	1980	1990	2000[2]	
Those who drink red wine with daily meals	222	251	46.0	25.4	30.6	18.5	4.5	older working-class men (2/3)[1]
Traditional gourmets drinking wine almost every day	153	171		4.8	4.4	4.1	3.5	rather old (37%)[1] and rich (18%) [1] working men; young middle-class people (13%)[1]
Those who drink wine on Sundays and on festive days	55	53	31.2	36.9	22.6	25.9	27.5	rather old rich men and women (25%), rather young middle-class people (30%)
Those who never drink wine	2	2	2.8	32.8	38.8	51.5	64.5	young men and women (53%); rather old working-class people (21%)

[1] Risk groups (consumers of >200 litres of wine and >35 litres of alcohol per year) who would be the principal target groups for nutrition policy.
[2] Estimate.

the four types of behaviours towards wine consumption among French people. The most striking facts of this evolution are:
- a sharp decline in the number of people drinking wine every day
- an increase in the number of non-consumers.
- a small increase in the proportion of Sunday drinkers.

The fact that most of the people who make up this group are older (although, fortunately, they do not all die of alcoholism!) is probably one of the reasons for this decline in the number of daily wine drinkers. The slow but steady destructuring of daily meals (probably due to an increase in the number of outside meals) is most certainly another cause for the fall in consumption of wine during these meals. Besides, some 'heavy drinkers', more and more preoccupied with their health, tend to drink less alcohol altogether (see above).

This halt in wine consumption is of course one of the causes for the increase of the proportion of non-consumers of wine. However, the most striking factor is the increasing proportion of non-consumers among young people.

Hence, the Latin model and the ritual of family meals with wine seem to become less attractive France so that the Frence life-style approaches the northern European

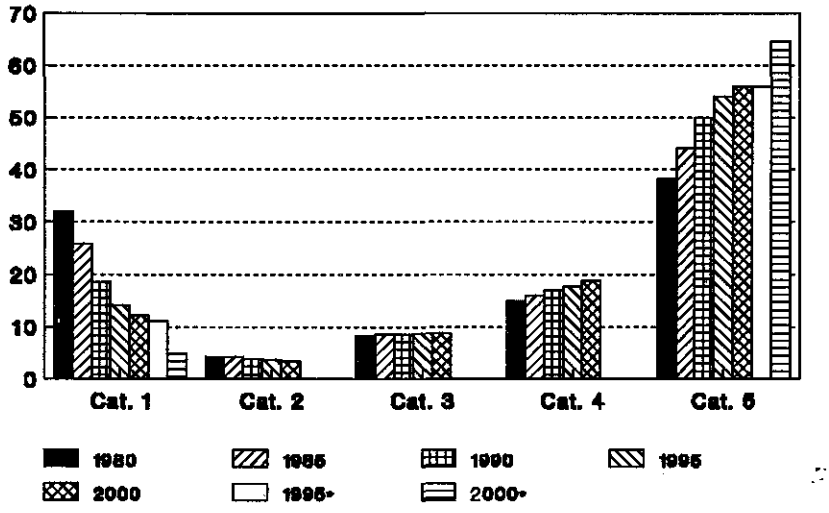

Fig. 1. Forecast of wine consumption behaviour in France. Two possible trends can be differentiated, viz. one ending in a proportion of 56% non-users in the year 2000 (clusters 1995 and 2000) and another one ending in 64.5% non-users (clusters 1995* and 2000*). The categories are: Cat. 1, those drinking every day (average annual consumption level 160 litres wine); Cat. 2, those drinking almost daily (128 litres); Cat. 3, those drinking once or twice a week (58 litres); Cat. 4, those drinking less than once a week (21 litres); Cat. 5, those drinking never.

and American way of life, where meals more and more destructured and even replaced by nibbling.

However, in contrast with northern Europe and North America, French people do not seem to drink more wine outside meals. French gastronomic culture in which wine plays an important part still dominates the organization of festive meals. Therefore, over time wine will mostly be consumed only with these kinds of meals and by the year 2000, more than 80% of wine drinkers will consume this beverage only on these special occasions.

Under these circumstances, the proportion of 'heavy drinkers' in France is likely to decrease sharply in the years to come. Nonetheless, there still remains two groups at risk:

- men from the working class (workers, farmers). They drink wine every day at home or in pubs; this group is involved most frequently in road accidents or accidents at work and it is a well known fact that these accidents are mostly due to intemperance;
- young men from the middle class who drink wine, beer or other alcoholic drinks almost every day and for the most part in pubs or restaurants (the rest is taken during festive meals).

What kind of nutritional policies can be followed?

Since there are many differences between the various behaviours towards the consumption of wines and alcoholic drinks in France, it seems obvious at first sight that a single policy could not have any influence on the population of drinkers as a whole. Thus, it is necessary to define the population groups being targeted, as is usual in marketing, knowing well that public funds are scarce.

Policy towards the 'heavy drinkers'

Considering that the members of this group have a low income, it would stand to reason that an increased taxation on wine would reduce the consumption of alcohol. However, such a policy might not modify the habits of such a rooted culture. Besides, as a majority of these 'heavy drinkers' are addicted to alcoholic drinks, they might refuse to reduce their wine consumption. Then, the tax might have an indirect effect on other expenses which make up the family budget (including the food part). Consequently, the drinkers' health and that of their family (if they have any) may be in danger.

Finally, such a measure would be so unpopular in France that any political figure who would have such an idea would abandon it immediately. As a matter of that, it would make other people unhappy, apart from the consumers of wine. Indeed, to make this idea of taxation work, it would be necessary to tax 'ordinary' wines, since these are the category most consumed this group. But these wines are also the main, or even the only, product of many wine growers in the south of France.

As for the communication policy which deals with negative effects of the consumption of alcohol on people's health, it did not seem to have much of an effect on this category, whose members are often convinced that they 'don't drink a lot'. Don't these drinkers say 'I drank too much' only when they have drunk more than usually? Even when they are in bad health, they are so dependent on alcohol that deterrent speeches are often useless.

On the other hand, some measures concerning driving may have direct consequences on alcohol consumption. Communication campaigns such as 'drink or drive, just make a choice' did not change people's habits. Some drivers take such advice into consideration and reduce alcohol consumption but rarely do they not drink at all before driving. The temporary driving bans on drivers in a drunken state, even if amplified by the media, did not have much of an effect either. However, the announcement of a new driving licence scheduled for late 1992 seems to affect more French drivers. Taxi and lorry drivers have even begun to oppose the plan. They have not publicly called for the right to drink before driving but it was strongly implied.

Policy towards the 'almost' daily drinkers

The measures mentioned above obviously concern this group, whose members take driving into consideration.

The recent television campaign targets the young people from the middle class. It shows that a young person who has drunk too much loses his/her credibility and is more or less seen in a negative light by his/her friends. Although the targeted audience is obvious in this particular case, the message may not have much effect. As a matter of fact, this social group does not like to drink alcohol unless they are with other people. This type of consumption is regarded as that of a drunkard and brings about laughs out of pity. On the other hand, young people tend to consume alcohol only on special occasions and with friends. It symbolizes feeling of happiness, escape and relaxation, making it nice to be together. Then, the person who has drunk too much is not considered to be a nuisance and could even become the life of the party.

However, this group is sensitive to health problems and is probably more influenced than others by the advertisements aimed at discouraging the consumption of alcohol. However professional sportsmen who are on a health diet by choice certainly have a greater impact than the slogan 'Drink in moderation'. Did not the Americans have a good example concerning AIDS, which certainly worries the young people more than the negative effects of alcoholism?

References

Aigrain P, Boulet D, Lambert JL & Laporte JP, 1991a. La consommation du vin en France en 1990. Evolution 1980-90. Projections 1995-2000. Rapports et annexes. INRA, Montpellier.

Aigrain P, Boulet D, Lambert JL & Laporte JP, 1991b. La consommation du vin en France: évolutions tendancielles et diversité des comportements. Rev Econ Mérid 39(3/4): 155-156.

Lambert JL, 1987. L'évolution des modèles de consommation alimentaire en France. Tec et Doc. Lavoisier, Paris. (Obtained the 'prix Jean Tremolières' in 1988.)

Lambert JL, 1990. Vins et comportements alimentaires. Des approches diverses. Symposium international du Centre interdisciplinaire d'Etude de la Vigne et du Vin'La vigne et le vin, les enjeux pour demain' (Montpellier, 30-31 May 1990).

Anthropology applied to food and nutrition policies

Arachu Castro

University of Barcelona and Maison des Sciences de l'Homme, Paris, France

The subject of this paper is the analysis of the contribution of anthropology to the interdisciplinary study of human food uses. The sociocultural study of food forms part of the process of recent research performed in the field of nutritional anthropology, and plays an active role in public health topics such as food and nutrition policies, nutrition education, and food aid programmes. If human beings do not eat everything available that is potentially nourishing it is because food forms part of the sociocultural organization of human groups.

Anthropological studies of food and nutrition have shown that eating does not have the sole aim of satisfying the physiological needs of the human body (de Garine, 1990: 1501), but also satisfies the sociocultural needs of social groups. As a classical anthropologist puts it, 'man [and woman] is the only animal able to discriminate between plain and holy water' (White, 1959). Given the fact that human nutrition is characterized by this duality, the sociocultural study of food is essential in order to avoid the clear and inappropiate separation that customarily characterizes the biomedical approach. The relevance of the research done in nutritional anthropology is underlined by the growing association between dietary practices and the incidence of certain diseases, and by the lack of qualitative research on important dietary variables (sociocultural) in nutritional processes (biological).

Although the biomedical field is recognizing that eating is a sociocultural process which constantly interacts with the biological process of nutrition, the study of food is systematically carried out far removed from the conceptual contributions of the social sciences, such as anthropology. The following two quotations from recent World Health Organization publications demonstrate that organization's willingness followed by its failure to incorporate the study of sociocultural issues into food and nutrition policies in Europe:

> 'The nutrient goals will in due course have to be translated into dietary guidelines. These have to be formulated on a local level, and will be determined by social and political boundaries and food traditions, also taking local food availability into account. The concepts of a socially and culturally acceptable diet will have to be investigated and used as a basis in the formulation of dietary guidelines, and also when deciding upon measures for implementation of the nutrition strategy.' (Helsing, 1987: 5).
> 'To summarize, three concepts have been used to describe objectives for nutrition policies. First, nutrient goals, established by nutrition scientists, are recommendations for the

distribution of energy sources in the diet and desirable levels of dietary components such as fibre and salt. Second, food goals based on nutrient goals, are established jointly by agriculture, trade and health policy-makers, for planning at the population level. Third, health goals are based on specific information on existing patterns in nutrition-related health conditions and a realistic expectation of the results of following nutritional recommendations. In addition, policy-makers may wish to convey their plans to the population through dietary guidelines established by trained nutritionists on the basis of nutrient and food goals. Such guidelines are formulated in a way that people can understand and act on.' (Becker & Helsing, 1991: 9-10).

As it is reflected in the latter quotation, nutritionists are expected to know the way in which people behave ('understand and act on') in addition to their understanding of foodstuffs and nutrients.

Nutritionists and dietitians tend to use the term 'food habits' when they refer to food issues that cannot be explained solely in terms of nutrients. Social scientists, in particular anthropologists, prefer the use of a wider and more neutral term, 'dietary practices' (Calvo, 1983; Sharman et al., 1991), which refers to the sociocultural aspects of food that interact with biological and environmental factors.

The transmission of dietary practices involves a twofold process. It is the core of a technical and specialized education: of food habits and food techniques, such as cuisine, meal schedules, and meal composition. At the same time it is the core of a general education: of implicit cultural traits, such as gender, age, social status, and cultural identification. Following this definition, food habits are only the most tangible side of dietary practices, and very often the only one taken into account when studied by nutritionists and dietitians through such techniques as 24-hour dietary recalls or food frequencies.

Food as a process of socialization must be approached from anthropological and sociological frameworks. Through culture – together with biological and environmental factors – human beings define and rationalize edible and non-edible categories of food among those available. Through culture people also define how foods can be combined, who can eat with whom, what ways there are of preparing food, who prepares it, as well as how often one eats and at what times. These variables integrate a dynamic body in which some parts change with time while others resist. Since the transmission of dietary practices is most active during socialization, the first thing that should be studied is how children are socialized via dietary practices.

Second, food needs to be studied as the foundation of a more general cultural education. It is a process of cultural reproduction, just as learning how to talk, read or write. In a theater play by Ionesco, a family mother says after dinner to her husband: 'For dessert we should have had a little glass of Australian Bourgogne wine, but I did not bring the wine to the table so not to give the children a bad example of gourmandism. We have to teach them to be sober and measured in life' (Eugène Ionesco, *La cantatrice chauve*, 1954). In this play the mother is using food to transmit certain values of their sociocultural group, not just to feed her children.

Nutritional and anthropological studies share the subject of food and yet analyse it from a disciplinocentric school of thought that prevents their integration. It is an

interdisciplinary problem that consists of a difference of reasoning between nutrition science and social anthropology, as a result of their different epistemological and methodological traditions. Each field conducts its own investigative process and has its own theoretical framework which defines its approach to food as the subject of study. The table below, which includes some of the points developed by Cassidy (1991), introduces the main theoretical paradigms that differentiate both approaches:

Biomedical approach (nutritional)	*Sociocultural approach (anthropological)*
Eating satisfies the physiological needs of the human body	Eating satisfies the sociocultural needs of social groups
The expert is outside and above the system and feeds expert opinion into a largely empty vessel	The expert is partof the system and shares his/her knowledge with others who also have knowledge albeit of a different kind
The research goal is to find out how many people have 'correct' or 'expert' knowledge in order to determine the size of the ameliorative project that must be taken on *(quantitative approach)*	The research goal is to find out what people believe so that strategies can be developed to offer new knowledge in ways that 'make sense' *(qualitative approach)*
Prefers to design a single message which is intended to be applicable to all	Prefers to design messages to suit specific audiences
Is more concerned with food and nutrients – that is what nutritionists are trained for	Is more concerned with people and social groups – that is what anthropologists are trained for

Secondly, application in Europe of anthropological findings in nutritional public health and in food and nutrition policies is especially slow due to the lack of European tradition in nutritional anthropology. The main studies in that field have been carried out by American researchers, whose main goal is to promote health through the change of dietary practices, but with little interest in theoretical development. The majority of European social research into food has been conducted by the French. Generally they are not health-oriented and more concerned with anthropological theory than with practice, as their main goal is to analyse social processes related to food.

The major contribution of American anthropology to the interdisciplinary study of human dietary practices centres on applied and methodological levels. After the pioneering work in the 1930s by the British anthropologist Audrey Richards, the study of food as a central focus of research started in the USA in the 1940s with the work of Margaret Mead (Montgomery & Benett, 1979). Subsequently it has been developed mainly by the members of the Council of Nutritional Anthropology (CNA), a section of the American Anthropological Association. These researchers have developed a systematic methodology for collecting qualitative data on dietary practices and quantifying them, as is obvious from the leading manuals published on the anthropological study of food (Fitzgerald, 1977; Jerome et al., 1980; Quandt & Ritenbaugh, 1986; Pelto et al., 1989).

The American research trend basically consists of anthropology applied to nutrition and public health, and is characterized by the search for a systematic methodology and a quantitative focus that gives priority to pragmatism in fieldwork and data processing. The quantification of sociocultural variables related to food has permitted the introduction of anthropology into numerous studies of nutritional public health. This near-interdisciplinary methodology is achieved through a process of mimicry by means of incorporating methods of other fields into anthropology. The resulting pragmatism makes the elaboration of theories difficult. Usually the data are collected without an implicit theoretical framework and are analysed as they are needed – and financed – for implementation. This lack of theoretical construction impedes in turn the results of this applied research from being reinvested in fundamental anthropology, and maintains the subjection of anthropology to nutrition and public health.

French research on sociocultural factors of food developed later than in the USA, mainly at the Maison des Sciences de l'Homme (at Paris) and at the Centre National de la Recherche Scientifique. The earliest works on food as the focal point of study were done by historians, who started in the 1960s in the journal Annales, Sociétés, Civilisations, Economies (1961). At the same time, Claude Lévi-Strauss referred to food in order to develop his structuralist theory.

Towards the end of the 1970s and throughout the 1980s many new publications containing independent high-quality sociocultural studies of food appeared in France. The main journals are Information sur les Sciences Sociales (including the section 'Anthropology of food' since 1979) and Food and Foodways (French and American publication on the anthropology, sociology and history of food, started in 1986), together with some issues of Communications (1979: 31), Ethnologie Française (1980: 10), Revue Française de Sociologie (1980: 21), and Jatba (1988: 35). In French research, food as the subject of study serves as a tool for the development of anthropological theory. Methodologically, this trend emphasizes the qualitative approach and the sociocultural interpretation of data.

Nutrition, in the broad sense, is the science that studies the biological phase of eating, but not dietary practices. The conceptual and methodological development of the science of nutrition is based on three stages, which in principle present a diachronic form but which in reality interact simultaneously. The first stage consists of experimentation with laboratory animals, the second stage involves the study of people at the hospital level, and the third stage is the epidemiological study of population groups, at the hospital as well as at the community level. Even though the strict control of variables in the laboratory cannot be maintained in the other two environments, the same theoretical references are maintained in all three. These are based on the concept of food as an exact subject of study, susceptible to being approximated to quantitative methods, even at the population level. As the sociocultural factors do not form a part of these references, but rather are considered as a group of subjective variables, they are studied only insofar as they can be quantified.

On the other hand, the science of nutrition conceives human nature in a universal way. With difficulty it is accepted that sociocultural variability interacts with biological processes, which creates nutritional variability at the group level and not

just among individuals. The results obtained from the study of a population group are inferred with ease upon other groups. In many cases this means that the inferences are based on the idea of the 'average citizen' developed in the industrial society which is then applied universally.

Nutrition policies usually are developed in the field of nutritional sciences: some nutritional imbalances are detected and these are related to some dietary practices – incorrectly named 'food habits' – that are considered unhealthy. The result is a top-down normative model, that is, a manual of behaviour. As programmes are designed from the perspective of nutrition experts, unintended sociocultural consequences – which provide the key to the effectiveness of the implementation – are neglected. As implementation means planned change, nutrition policy-makers should spend some of their planning time considering not only health changes but also forecasting its sociocultural impact.

The sociocultural study on food suggested in this paper combines American and French anthropological research. The type of study encouraged here is health-oriented and is also intended to contribute to the understanding of dietary practices in a holistic framework. One example of such a research is a recent study carried out in Spain (Castro, 1991, 1992) on the analysis of both the dietary practices and the nutritional status of urban and rural households in La Rioja, one of the 17 autonomous communities constituting Spain. The study was financed by the Department of Public Health of that local government, and the goal of the research was to outline an effective programme of nutrition education implementation for that region that would include the point of view of its population.

The research incorporated the ethnological method of approach and some ethnographic techniques. It was meant as a pilot study to obtain a first overview of the general dietary and nutritional trends of the population concerned. For that reason it was decided to undertake a deep study of all the members of 20 households, both from urban and rural settings. The data were collected through *interview techniques* – life histories, 24-hour dietary recalls and a Q-sort technique –, *written respondent records* – food accounts, food diaries and an inventory technique – and *participant observation*. The nutritional data were processed with a nutritional database for Spain ('Valoración nutricional de la dieta', Wander Laboratories) and then analysed statistically together with the sociocultural data. The Q-sort technique designed for this project, later called the 'Gusto Game', was based on a card game with 70 foodstuffs and four variables: food preferences, food frequencies, health values of foodstuffs, and social prestige of foodstuffs. The 70 foodstuffs were selected as the ones with a consumption level comparable to the rest of Spain, based on the data from the National Institute of Statistics (Instituto Nacional de Estadística, 1984a, 1984b).

The evaluation of the data permitted setting nutritional priorities for the population studied, and to design a nutrition education programme culturally acceptable to that population. The cultural acceptance was predicted from the qualitative information obtained from participant observation and life histories – which gave information on the way dietary practices had evolved – and from the quantitative data provided by the Gusto Game, which gave information on food likes and dislikes, on food frequency

intake, on health knowledge, and on social prestige of foodstuffs. Both qualitative and quantitative data were most valuable in order to understand dietary practices as a twofold process. If dietary practices were not fully understood, how could we expect to change them?

The Gusto Game revealed that the categorization of foodstuffs made by the population studied differed from that used by nutritional scientists when addressing themselves to that same population. For instance, the health values of pork and eggs illustrate that point. Health values of any foodstuff could rank from 1 to 3, and were classified as 'it is good if eaten frequently' (1), 'it is neither good nor bad' (2), and 'it is bad if eaten frequently' (3). The mean values of three pork products were: lean pork meat 2.43, red hot sausage 2.15, and ham 1.63; and those of eggs cooked in two ways were: fried eggs 1.87, and plain omelette 1.46.

The participant observation approach permits the interpretation of those data from the population's point of view. That is, the three pork products compared have their own identity as foodstuffs – 'ham is better than red hot sausage, and red hot sausage is better than lean pork meat' – even if that same population knows that they all come from the same animal. Consequently, implementation and survey programmes for that specific group should be addressed in terms of the three different types of food, instead of including all of them in the group 'pork'. The same principle applies to 'eggs'.

As a result of the comparison between anthropology and nutrition it is revealed that the anthropological contribution is not only important in the development of human nutrition theory, but also for its scientific application. The analysis presented in this paper shows how the incorporation of anthropological theories and methodologies in the study of human diets can provide key behavioural insights beyond those found from a strictly nutritional perspective. The acknowledgement of food as a sociocultural process is essential in order to demedicalize public health programmes and give valuable perspectives to nutritional public health and nutrition policies.

References

Becker W & Helsing E (Eds.), 1991. Food and health data: their use in nutrition policy-making. WHO Regional Publications, European Series No 34. World Health Organization, Regional Office for Europe, Copenhagen, 171 pp.

Braudel F, 1961. Alimentation et catégories de l'histoire. Annales 16: 723-728.

Calvo M, 1983. Des pratiques alimentaires. Economie Rurale 154: 44-48.

Cassidy C, 1991. Yuppies, muckies and natives, an informal exploration of philosophy of method in nutritional anthropology. Paper presented at the Annual Meeting of the Society for Applied Anthropology, 19 pp.

Castro A, 1991. Para un análisis socioantropológico de las prácticas de alimentación. Rev Esp Invest Sociol 53: 199-222.

Castro A, 1992. Alimentación, Cultura, y Grasas: un proyecto de salud pública nutricional para la población de La Rioja. Consejería de Salud, Consumo y Bienestar Social del Gobierno de La Rioja, Logroño .

Fitzgerald TK, 1977. Anthropological approaches to the study of food habits: some

methodological issues. In: Fitzgerald TK (ed.), Nutrition and anthropology action, pp. 69-78. Van Gorcum, Amsterdam.
de Garine I, 1990. Les modes alimentaires: histoire de l'alimentation et des manières de table. In: Poirier J (ed.), Histoire des moeurs: les coordonnées de l'homme et la culture matérielle., pp. 1447-1627. Gallimard/Encyclopédie de la Pléiade, Paris.
Helsing E, 1987. Nutrition policies in Europe: action now. Zywienie Czlowieka i Metabolizm 14: 3-19.
Instituto Nacional de Estadística (ed), 1984a. El consumo de alimentos, bebidas y tabaco en cantidades físicas. Encuesta de Presupuestos Familiares 1980-1981, Tomo III. INE, Madrid, 255 pp.
Instituto Nacional de Estadística (ed), 1984b. Estudio sobre nutrición. Encuesta de Presupuestos Familiares 1980-1981, Tomo V, 1ª y 2ª parte. INE, Madrid, 1322 pp.
Jerome NW, Kandel RF & Pelto GH (eds.), 1980. Nutritional anthropology. Redgrave, Pleasantville, NY.
Montgomery E & Bennett JW, 1979. Anthropological studies of food and nutrition: the 1940s and the 1970s. In: The uses of anthropology, pp. 124-144. American Anthropological Association, Washington, DC.
Pelto G, Pelto P & Messer E (eds.), 1989. Research methods in nutritional anthropology. United Nations University, Tokyo, 201 pp.
Quandt SA, Ritenbaugh C (eds.), 1986. Training manual in nutritional anthropology. American Anthropological Association, Washington, DC, 151 pp.
Sharman et al., 1991. Diet and domestic life in society. Temple University Press, Philadelphia, PA, 287 pp.
White LA, 1959. The evolution of culture. McGraw-Hill, New York.

Concluding plenary session

After the Big Bang: structure of food and nutrition policy-making processes in Europe

Nancy Milio

University of North Carolina, Chapel Hill, NC 27599-7460, USA

Introduction

We are all familiar with the theory of the Big Bang: the enormous burst of energy that occurred 10 or 20 billion years ago and continues to disperse in ever-cooling galaxies throughout the universe. Within this vast disintegration there formed the complex organization known as planet Earth, eventually evolving human life (Davies, 1988).

In many ways the recent history of Europe mirrors this paradoxical cosmos: apparent division and disintegration alongside the growth of organized complexity among diverse parts. The realistic imagery for this environment for the foreseeable future is no longer the simplified assumption traditionally held by both liberal capitalists and Marxists of an upward arrow of progress (Vickers, 1972). More apt might be a contextual view of coexistent chaos and order.

Public policy-making and environment

Public policy is the most common and powerful tool in modern societies to promote coherence amid chaos, unity amid diversity. Recognizing reality, policy-making in Europe will have to operate in a more turbulent and unpredictable environment than usual. This fact has also implications for the structure or pattern of food and nutrition policy-making processes.

If we assume that the 'New Nutrition' (i.e. generally accepted recommendations for low-fat, high-fiber national diets outlined in many national and WHO reports (e.g. James, 1988; WHO, 1990, 1991; Anon., 1988)) is a national dietary pattern that can improve the health of populations, and that policy is the best instrument to ensure that the benefits are equitably distributed, then the policy issue is 'How to structure the development of effective food and nutrition policy, i.e. develop it in ways that can realize its potential to improve the health of all sections of society?'

This problem in policy-making can no longer be addressed by ways that may have been appropriate in the past, i.e. by asking whether it should be centralized or decentralized; whether organizations should be 'autonomous' or controlled; whether

'democratic freedom of choice' is to be thwarted. For in an environment that is rapidly changing, contentious and unpredictable, structures and processes must be adaptable. 'Autonomy' no longer exists. Organizations and countries may try to be autonomous, but they will not succeed. Accountability – to constituencies (whether to shareholders, consumers, taxpayers or governments) if not to society as a whole – must now replace autonomy.

Choice also takes on a more relative meaning than ever: even in the most democratic societies, the poor have never had 'free choice' in what and when they would eat, nor do those whose lives are chaotic and insecure, for whatever reason. Similarly, organizations, governmental or other, have rarely had – and in turbulent environments can never have – freedom to choose any action they may wish. Stability affords more potential for freedom than chaos does.

Public policy

By definition, public policy is simply a guide to government action; this includes the ways that government uses to guide the actions of other parts of society – for-profit and non-profit organizations, other jurisdictions, and citizens. This attempt to bring a degree of coherence and unity to the otherwise chaotic and extravagant and inequitable use of resources in society implies coordinated activity. Thus the question for nutrition policy-making is: how can coherence and a degree of coordinated activity in food and nutrition be achieved in a context of rapid change and uncertainty? There can be no ready-made answer, of course. At best we can hope to define a process that will have realistic potential to develop effective nutrition policy.

Organization for action

So, in order to develop effective nutrition policy, a source of stability must emerge in the universe of contending organizations and other social forces. Some unit or group with shared views must first form, around which political and social momentum can grow. This group then becomes the means to move a policy from idea to formulation and governmental adoption, implementation, evaluation and ongoing reformulation, i.e. the familiar, continuous and not necessarily linear processes that characterize all policy-making (Fig. 1).

Whether this unit begins in or outside government, whether it is a single entity or a differentiated network, and whether its shape changes over time as its tasks change is not of primary importance. What is crucial is the purpose of this unit (which I call the 'policykeeper', and others have called the 'champion' or 'change agency', or 'policy manager'): the management of policy development to ensure momentum in policy-making, i.e. to make policy-making effective (Milio, 1988b, 1990; Rathwell, 1992; Goggin, 1987).

Effective policy-making means: defining policy problems and goals; selecting and implementing policy instruments that can meet the goals; devising the strategic framework and processes to do these things and evaluate their impacts; and ensuring a

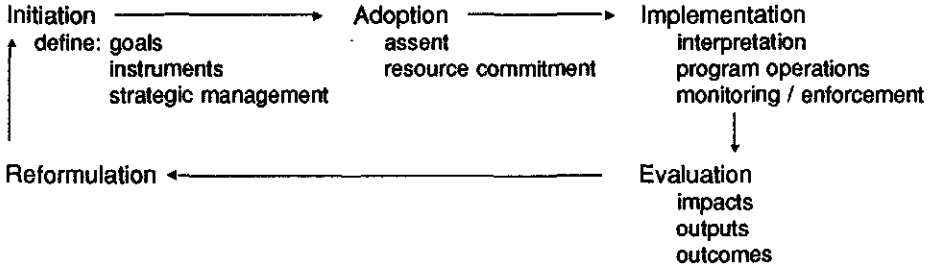

Fig. 1. Policy-making processes.

political and social climate that enables these activities to move forward.

The scope and complexity of these tasks is multiplied in the area of food and nutrition policy because of the substantive complexity of the policy itself: it involves many governmental sectors and many interests, all of which compete to secure their own stakes in policy development. It is therefore not surprising that, over and above the inherent political, socio-economic and historical differences among countries, they have chosen a variety of ways to bring coherence to food and nutrition patterns among their peoples in order to improve the health of all.

This paper will outline the most common patterns of policy-making among mainly European countries, pointing to the advantages and problems that have been experienced with each. It will then suggest the essential tasks for effective nutrition policy-making around which organized structures and processes can form, depending on the particular environments of individual countries and the politico-economic climate of the European Community (EC).

Common patterns of nutrition policy-making

The modes of policy-making often pursued in Europe may be viewed as explicit or implicit, and not necessarily mutually exclusive (Fig. 2). In this universe of

Scope	Nutrition policy-making processes	
	Explicit	Implicit
Nationwide	central government mandate model	traditional sectoral model
Sub-national	local government, policy-linked model	ad hoc project model

Fig. 2. Nutrition policy: common patterns of public policy-making processes.

organizations, in which several of these avenues to policy development may coexist, which kinds of entities have been most successful in bringing coherence to food and nutrition policy-making for health purposes? By first looking briefly at the patterns or models of policy-making structures that exist in several countries – within the limits of a paucity of reliable data – we might at least suggest the advantages and problems associated with each. However, more importantly than seeking an ideal structure, we will then examine the strategic goals that effective policy-making structures must pursue, regardless of their shape(s). For the shape must finally be molded by the sociopolitical environment of the parent country.

Traditional sectoral model

To begin by noting the traditional implicit, sectoral, budget-derived approach to food and nutrition is to dismiss it as a model to emulate for the future. Historically, this quantity-driven mode has been successful in reducing or eliminating hunger, but not, by itself, reducing chronic nutrition-related illness in the contemporary affluent world. At best, it produces inconsistent health results, not to mention high costs in energy, environmental damage and inequitable resource distribution. The major players in this process have been the traditional powerful interests in the farm-food sector, usually linked to particular political parties and ministries (Milio, 1991a). While food quantity will remain an important policy focus in those European countries where food is scarce, it will have to be accompanied with a view to assuring the macronutrient quality of the national diet if the long-term costs of preventable disease are to be avoided.

Project models

Another very common, subnational model of policy-making is the project model. It may be local, such as the North Karelia Project, or regional, such as in Wales and southern Portugal (Puska et al., 1991; Parrish et al., 1987; Amorim-Cruz, 1987; Milio, 1990a). These projects, if funded by government, may be thought of as an explicit element of policy, and in some countries may constitute the entire scope of nutrition policy. Projects may also be privately funded, perhaps through research or foundation grants without explicit policy purposes, and may then be viewed as a process that may explicitly influence policy-making such as when planned activities affecting food supply or consumer demand are conducted for business, educational or health purposes. If the project model is extended across national boundaries, as is SUPER, the 5-city/5-country European Food and Shopping Research Network, coordinated in the Netherlands, it is a network variation, similar to the Healthy Cities networks within and between countries (Vaandrager, 1991).

The value of projects for policy-making vary with their design. A few of the newer generation offer more hope for policy impacts than in the past in that they address both the supply and demand for food and include the total community population, not just statistical groupings with specific high risk factors. They aim at organizational,

not just individual, change and they focus on major dietary and health issues, not just one or two 'factors' in isolation (Milio, 1990a). In effect, they recognize that life is lived as an integrated whole and that organizations – whether governmental, commercial or voluntary – set the options for what individuals can do, and so can create both healthy and unhealthy choices for people (Milio, 1986). A few projects, like the Stockholm Cancer Prevention Program and SUPER, specifically state their intention to influence governmental policy-making.

A project avenue into nutrition policy processes has the advantages of experimentation and demonstration, as well as perhaps the building of a local infrastructure of organizational competence and awareness of the issues. It also has severe limits in its capacity to influence policy. By definition, projects are time-bound and restricted in their financing. Their local impact is almost always short-term and confined to their immediate population. They also tend to divert attention away from the structure and direction of existing organizations. Finally, 'recommendations' are often made to no one in particular or, if to the government, this advice is not part of a plan to actually take the implications into the political arena – all of which would require additional time, staff, skill and other resources (Institute of Medicine, 1991). A rare exception to this problem is the continuing influence the North Karelia Project and its spin-offs have had on nutrition policy-making in Finland; this was not an initial goal of the project.

Local-government policy-linked model

Another local model, that of local government, has all of the advantages of the project model, but not all of its problems. When a local government actually adopts a nutrition policy, as did the City of Toronto through its policy-keeping Food Policy Council, the benefits of the resulting dietary changes can be sustained and built upon over time (Toronto Food Policy Council, 1991). Furthermore, this experience that develops organizational competence will not be lost and may be shared. However, local policy clearly cannot affect food production very much, since that is the purview of national policy. Local policy can ensure equitable access to healthy food options for the local population. Further, since the local government does not have the time and resource constraints of the ad hoc project model, it can, if the political will exists, attempt a longer-term strategy to affect national policy processes. This potential can be augmented when local governments undertake a planned approach through a network, as could be done through Healthy Cities. Otherwise, again, the benefits of local nutrition policy will be confined to the immediate population, and the gains in demonstrated dietary and organizational change will be lost from the eyes of national policy-makers.

Central-government mandate model

Finally, we have the national model as a structure for explicit nutrition policy-making (Anon., 1986; Anon., 1985; WHO, 1988; Kelly, 1986). This may be governmental, as

is the Finns' National Nutrition Council, or non-governmental in administration, as is the British Health Education Authority. The governmental structures have the obvious potential advantages of authority to make widespread changes over the long as well as the short term, to equalize the benefits across all sections of the population, and to spread the burden of major changes equitably among affected groups, organizations and regions.

National government policy bodies created to manage policy development, such as those of Norway and Finland, have made measurable changes in the composition and availability of the national food supply. They have, for example, achieved health-promoting shifts in food production subsidies, provided incentives for low-fat milk and lean meat production, improved the quality of vegetables, promoted access to fish, enhanced the content and accuracy of food labelling, enlarged and improved public information as well as professional and school-based nutrition education, and expanded nutrition program and policy-related research.

However, it must also be said that these changes that promote a more healthful national diet came slowly, over many years, and only when it became in the economic and political interests of powerful groups to make the changes. Often, the impetus came from world economic and political conditions and occurred regardless of the ideology of the government of the day (Milio, 1988a, 1989, 1990a, 1990b; Ziglio, 1986; Bagchi, 1990).

Much of the presumed potential power of national governmental structures in guiding nutrition policy toward a healthier national diet has not been realized. The basic cause may be termed a lack of political will. That is, the political costs of confronting agricultural and food industry interests with change, combined with a comparative absence of organized pressure to promote healthy change have been too high. In the current European climate, rapid dietary changes will occur, many unplanned and some unwanted. These will occur because of strained economic conditions on the one hand and from the pressures toward entry into the European market on the other, with consequent open borders to new products, new cultures and values, new pricing, financing, and food companies, as well as new sources of commercial and educational information.

One can only hope that these changes will be monitored and that organized voices will be raised to advocate more healthy rather than less healthy adjustments to the new, open and turbulent environment, and that these adjustments will be guided by policy measures.

Most of the observable problems of the national model in nutrition policy-making appear to flow from the lack of political and bureaucratic commitment to and accountability for improving nutrition policy. This is apparent from the dearth of resources provided to the bodies – the nutrition councils – intended to manage policy processes, thereby failing to develop an institutional capacity for vigorous policy leadership. This, in turn, has meant little or no strategic planning or coordination; little integration of policy goals in other policy sectors; and no concerted effort to build up the necessary local infrastructures of organizational competence to implement policy measures effectively (Hognestad, 1990).

Further, far more could be done to use the vast market power of governments to promote a healthy food market through following New Nutrition policy guidelines in government food purchases for public employees, clients, patients, inmates, students and military personnel. More could be done to monitor and improve the accuracy of nutrition information in the advertising media, both printed and electronic, domestic and foreign. And more must be done to bring the benefits of a healthy and attractive diet to the groups and regions that so far have not had their fair share of accessible information and food products (Milio, 1991b).

Having noted these major problems of central nutrition policy management, national leadership nonetheless seems essential if local populations are to benefit from policy changes. The widespread lack of policy awareness and action in local authorities in England, for example, has been attributed to the perceived absence of national leadership and support, as well as central government demands that divert attention to other priorities (Rathwell, 1992). National leadership, institutionalized in a visible and accountable entity can, at a minimum, create policy awareness and understanding, build policy legitimacy, define organizational responsibilities, and encourage, if not require, public reporting of nutrition actions taken by all parties involved.

A three-dimensional view

Finally, it is safe to say that, up to now, nutrition policy-making processes have involved mainly in-country structures. As suggested above, this is no longer likely to be sufficient. Nutrition policy, as so many other types of policy (Weibull & Anshelm, 1992), is also being formulated – both explicitly and more so implicitly, coordinated or not – by the EC. Its consequences will be felt increasingly by all of Europe, both members and partners. This implies that policy management structures will need to be trifocal: national, local and Euro-focused.

Strategic goals in policy management

As this discussion suggests, all organized structures and processes are less than perfect. What then are the capabilities that any system of policy management must have, whatever the form, in order to support a nutrition policy that can produce and sustain a healthy national diet? The following organizational competencies appear to have been important to successes in policy-making in various countries (Milio, 1990a, 1990b, 1991b; WHO, 1988, 1991). The absence of such competence has meant failure. The emphasis here is on strategy rather than particular structures, which necessarily will differ from country to country and from time to time.

At the outset, the policy management apparatus itself must have the resources that will allow it to act effectively. This means: appropriate staff, funds, recognized authority and legitimacy, and access to essential information and data, to the media and to decision-makers.

Then the first step for a policy management structure is to develop a strategic plan to guide its own work, including an assessment of the feasibility of various actions

and of the capacity of relevant parties, such as local governments, institutions and entrepreneurs, to carry out their responsibilities.

The strategic goals that are necessary to move policy would then include: (1) promotion of a supportive climate, (2) promotion of organizational responsibility, and (3) improvement of policy processes and content..

1. Promote a supportive climate

- Develop a legitimating rationale for the policy, i.e. why various interested parties (whether in or outside the government) should view the policy as important, and how their purposes might be served by it if they change what they customarily do. For example, for the business sector, profits might rise for producers and advertisers who could be seen by consumers as providing reliable information and reasonably priced, verifiably healthier food products tailored to all sections of the population and all communities.
- Ensure ongoing accurate and accessible information/education of all affected parties and their constituencies about the nature and progress of policy development.
- Improve the quality of food and nutrition information available from the governmental and private sectors, and challenge the accuracy and adequacy of available materials, standards and practices.
- Ensure the equitable deployment of policy incentives and constraints.
- Ensure social equity in the potential benefits of the policy, including availability of and access to suitable information and affordable, attractive food products.
- Ensure the monitoring of actions taken by all responsible parties and institute accountability procedures accordingly.
- Ensure the conduct of research to evaluate policy processes, programs, impacts and outcomes in organizations and populations.
- Establish means to assure public accountability to the parliament, the media and the general public through such means as public reporting, support for 'watchdog' groups and funding of policy development research.
- Monitor the national and international environment for changes and opportunities to undertake timely action to strengthen policy development.

2. Promote organizational responsibility

- Involve all affected parties in policy development to the extent feasible for ensuring progress, including economic and labor interests, bureaucratic sectors, health and consumer groups, media representatives, organizations with local links and others with EC ties, and those who represent disadvantaged minorities.
- Clarify the responsibilities of each of the affected parties and their constituencies.
- Ensure the integration of the policy in relevant policy sectors, including health services, food safety and quality regulation (Orbeck-Sorheim, 1990), general and professional education and training, agriculture, environment, trade, foreign affairs, information and culture, telecommunications, industry, labor, and government administration. This will be especially important and difficult as EC policy in these sectors unfold (Milio, 1990a).

- Promote the use of government market power in all jurisdictions to purchase food supplies consistent with policy dietary goals so as to promote local and national markets for healthy foods as well as to benefit government staff and clients.
- Promote and support linkages and feedback processes with counterparts in local communities, transnationally and at the EC.

3. Improve policy processes and content

- Review, propose, advise and report on progress and problems, as well as reformulations for policy improvement.
- Advocate needed improvements by policy-makers in concert with allied groups in national and EC arenas.

These, as all policy-making tasks, can be formidable. Yet all have been accomplished to some degree and hence are possible in the real world of political economies. Persistence and strategic thinking are what count. Sustained organizational attention is crucial to effective policy-making. We have learned from years of experience, not only with nutrition policy (Vartiainen et al., 1989), but also with alcohol and anti-tobacco policies (Rahkonen & Ahlstrom, 1989; Rahkonen et al., 1991, 1992; Puska et al., 1989), that continued effectiveness cannot depend only on the strength of scientific evidence, or on the impact only of individual local programs. Of themselves, these will never sustain healthful national trends nor remedy inequalities in health. What is essential is constant organized policy management that is sensitive to changing environments and adjusts strategy accordingly, emphasizing monitoring and enforcement, accountability, advocacy and the maintenance of political and public support. Turbulence offers the possibility for innovation and not only chaos. Sustained collective effort is what can make the difference.

References

Amorim-Cruz C, 1987. The food and nutrition situation in Portugal. J Centre Nutr Res 11 (Sep-Dec): 3-23.

Anonymous, 1985. Value for effort. Health Education bureau, Dublin.

Anonymous, 1986. Charter for action Health for all by the year 2000. Faculty of Community Medicine, London.

Anonymous, 1988. Dietary guidelines: international and national perspectives. Nutr Rev 46: 236-240.

Bagchi K, 1990. Towards a national nutrition policy. Guidelines for countries of the Eastern Mediterranean Region. World Health Organization, Alexandria.

Davies J, 1988. Cosmis blueprint. Simon & Schuster, New York.

Goggin M, 1987. Policy design and the politics of implementation. University of Tennessee Press, Knoxville, TN.

Hognestad AK, 1990. Food and nutrition policy in Norway: the Norwegian nutrition policy and the municipal health services as an instrument of implementation. Department of Health, Ministry of Social Affairs, Oslo, June 1990.

Institute of Medicine, 1991. Improving America's diet and health. National Academy Press, Washington, DC.
James W, 1988. Healthy nutrition: preventing nutrition-related diseases in Europe. WHO Regional Office for Europe, Copenhagen.
Kelly A, 1986. Nutrition surveillance in Ireland: Report for 1985. Medico-Social Research Board, Dublin.
Milio N, 1986. Promoting health through public policy. Canadian Public Health Association, Ottawa.
Milio N, 1988a. An analysis of the implementation of Norwegian nutrition policy, 1981-87. Prepared for the World Health Organization (Europe) Conference on Food and Nutrition Policy, March 1988. WHO Regional Office for Europe, Copenhagen.
Milio N, 1988b. Making healthy public policy: developing the science by learning the art: an ecological framework for policy studies. Health Promotion Int 2(3).
Milio N, 1989. Nutrition and health: patterns and policy perspectives in food-rich countries. Social Sci Med 29: 413-423.
Milio N, 1990a. Finland's food and nutrition policy: progress, problems, and recommenda tions. Report to the World Health Organization. WHO Regional Office for Europe, June 1990.
Milio N, 1990b. Nutrition policy for food-rich countries: a strategic analysis. John Hopkins Unversity Press, Baltimore.
Milio N, 1991a. Food rich and health poor: dimensions of the problem and options for policy action. Food Policy 16: 311-318.
Milio N, 1991b. Toward healthy longevity: lessons in food and nutrition policy development from Finland and Norway. Scand J Social Med 19: 209-217.
Orbeck-Sorheim A, 1990. Food safety and nutrition: a strategic alliance. Norwegian Central Food Authority, Oslo.
Parrish R, Catford J & Hovsen H, 1987. Promoting health through collaboration with industry and commerce. Presented at the Conference on Community-Based Prevention and Health Promotion, Düsseldorf, March 1987. WHO Regional Office for Europe, Copenhagen.
Pietinen P, et al., 1989. Nutrition as a component in community control of cardiovascular disease (the North Karelia Project). Am J Clin Nutr 49: 1017-1024.
Puska P, Tuomilehto J, Nissinen A, et al., 1989. The North Karelia Project: fifteen years of community-based prevention of coronary heart disease. Ann Med 21: 169-173.
Rahkonen O & Ahlstrom S, 1989. Trends in drinking habits among Finnish youth from 1973 to 1987. Br J Addiction 84: 1075-1083.
Rahkonen O, Lahelma E & Manderbacka K, 1991. Gender and socio-economic differentials in health in Finland, Norway and Sweden. Paper presented at the American Public Health Association's 119th Annual Meeting and the World Federation of Public Health Associations' 6th International Congress, Atlanta, GA, November 10-14, 1991.
Rahkonen O, Berg M & Puska P, 1992. The development of smoking in Finland from 1978 to 1990. Br J Addiction 87: 103-110.
Rathwell T. Pursuing health for all in Britain: an assessment. Social Sci Med 34: 169-173.
Toronto Food Policy Council, 1991. Report to the Board of Health, June 28, 1991. Toronto.
Vaandrager L, 1991. Super – the European Food and Shopping Research: a five-country study to create improved choice for healthier diets by involving the community and the supermarket. managers/management. Department of Extension Science, Wageningen Agricultural University, Wageningen, Netherlands, June 1991.
Vartiainen E, et al., 1989. Changes in cardiovascular risk factor patterns in treated and

untreated hypertensive Finnish men and women during 1982-1987. Report. National Institute of Public Health, Helsinki.
Vickers G, 1972. Freedom in a rocking boat. Penguin Press, Cambridge.
Weibull L & Anshelm M, 1992. Signs of change: Swedish media in transition. Nordicom Rev 1992(1): 37-48.
WHO, 1988. Nutrition policy experiences in nothern Europe. WHO Regional Office for Europe, Copenhagen, 1 March.
WHO, 1990. Diet, nutrition and the prevention of chronic diseases. Technical Report Series 797. WHO, Geneva.
WHO, 1991. Food and nutrition policy in Europe. Report on a WHO Conference, Budapest, October 1-5, 1990. WHO Regional Office for Europe, Copenhagen.
Ziglio E, 1986. 'Uncertainty' in health promotion: nutrition policy in two countries. Health Promotion 1: 257-268.

Workshop reports

Workshops

1. 'How can food producers and retailers make the healthy choices the easy choices?'
   Chair: T.R. Gormley & A.F. Onneweer
2. 'Food and nutrition policies in practice'
   Chair: E. Helsing & J. Schrijver
3. 'Legislation'
   Chair: M. Fondu & O. Korver
4. 'Intervention strategies (high-risk groups and/or mass strategy; public support or intervention'
   Chair: K. Babinská & R. Jonkers
5. 'Nutrition education for professionals'
   Chair: M. Gibney & G. Hiddink
6. 'Nutrition labelling and claims'
   Chair: D. Richardson & R.J.J. Hermus
7. 'Nutritional intervention (channels and integrated or isolated nutrition messages)'
   Chair: E. Feichtinger & J.G.A.J. Hautvast
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9. 'Common agricultural policy, food consumption and health'
   Chair: A. Swinbank & F. ten Hoor

Report of the workshop 'How can food producers and retailers make the healthy choices the easy choices?'

T.R. Gormley[1] & A.F. Onneweer[2]

[1] *Teagasc, The National Food Centre, Dublin, Ireland;* [2] *Ministry of Agriculture, Nature Management and Fisheries, The Hague, Netherlands*

Introduction

The European food system is complex and dynamic and the topic of this workshop represents a major challenge to virtually all the players in the food system. The purpose of the workshop is to attempt to obtain a consensus as to whether the topic is just an aspiration, or a realisable goal, or somewhere in-between. This introductory note focuses on some of the issues but does not attempt to give any of the answers.

The inputs to the topic are numerous and collectively form an interactive matrix which is difficult to dissect into stand-alone components. Firstly, there is continued confusion among health professionals about many of the dietary issues of today and this spills over to the consumer which is a 'bad start' in focusing on at least some of the healthy dietary options. Secondly, food purchase/choice in Europe is related to many factors including product sensory quality and diversity, price and value for money, promotion and advertising, cultural/traditional and regional preferences, and health considerations. These interact with consumer beliefs and motivation to purchase, with level of education and disposable income, with sub-groups within the consumer population; these in turn interact with agricultural food production policies and with the retailing policy of the supermarkets.

The so-called healthy choices are often of inferior sensory quality to the 'real thing', e.g. fat spreads vs butter; low fat vs whole milk; unsalted vs salted bread; sauceless food dishes. This currently militates against choosing the healthy options and challenges food technologists to create products which match the sensory quality of the 'real thing' while maintaining product safety, wholesomeness and a high degree of naturalness. Other aspects which aid healthy choices include competitive or lower pricing (currently the healthy choices are usually more expensive), and balanced consumer education on diet and nutrition.

The explosion of functional foods, while desirable, must be kept in context and one must ask 'Does a balanced diet not give us Europeans all the "functionality" we need?'. Central to the whole issue of healthy choices is the area of health claims and this must be regarded as both an ongoing and potential minefield which will be

increasingly difficult to interpret and to police as foods become more complex and functional.

The Common Agricultural Policy has dominated food production in Europe for many years and some aspects of the policy do not facilitate the healthy-choice/easy-choice slogan. In view of this, a balancing integrated downstream policy should be developed which is concerned with the quality and safety of the food supply in human nutrition terms.

It can be argued that the complexity of the European food system and of current food-health issues leaves the European consumer wide open to exploitation by the food industry and by retailers in relation to the foods produced and sold on the shelves. However, the opposite view must also be tabled, i.e. that the food and retail industries do have the consumers' best interest in mind and will promote food products and especially the healthy choices in a responsible and balanced way. In this context the power of supermarkets to influence food choice must never be underestimated. Increasingly supermarkets are becoming advice bureaus, food factories (e.g. in-store bakeries; sausage making; preparation of ready-to-eat and microwaveable foods), retailers, restaurants, and places of social interaction and so have a central role in the development of the healthy-choice/easy-choice concept in the Europe of the future.

Report

In affluent societies consumers' food choice is influenced by many factors which together form an interactive matrix. It is difficult to assess the effect of individual factors as well as the effect of the whole complex. Well known factors are education, culture and religion, income, etc. Besides, the type and quality of food on the market, the price and the outlets where food is available can strongly influence food choice and consumption.

As can be read from the title, the workshop focused primarily on the role food producers and retailers play or could play in helping the consumer make a more healthy choice. In six presentations by speakers form different parts of the world, an impression of the possibilities in this field was given. The presentations and the discussion – it was generally felt that time for discussion fell short – are summarized below.

W.S. Shrapnel (Australia) reported on an interesting experiment in Australia in which a logo with the claim 'healthy foodstuffs' was used in supermarkets. The idea behind this logo – an initiative of the Australian Heart Foundation – is to make it more easy for the consumer to pick from the thousands of food products offered in today's supermarkets the products that are especially valuable to compose a balanced diet. The background of the project is that for many people the way foods are commonly labelled is too complicated and hence not of much help. That may partly explain why many consumers read the labels only partially or not at all.

Research has shown that claims can be far more effective than nutrient labelling in

attracting the consumers's attention and influencing the consumer's food choice. However claims often focus on one specific aspect of the product in question., such as the high content of a specific vitamin or the low content of fat or cholesterol. Only in few cases claims are used to communicate the wholesomeness of a product in a global sense. Such claims could be really helpful to the consumer in making a better choice. The Australian logo can be considered as an example of a general claim. In using the logo the main nutritional goals are taken into account, not only those related to coronary heart disease. The main criteria are (saturated) fat, salt, cholesterol, fibre and sugar.

An advisory committee decides on requests for the logo from the industry and from retailers. Educational tools are used to inform the consumers and producers on the meaning and possibilities of the logo. Although the interest in the logo is increasing, the industry is also expressing doubts, in particular as to the implicit discrimination of products not bearing the logo. The logo is sought for a wide range of products based on meat, cereals, vegetables, fruits, fat, meals, and so on. Generally speaking, the consumers think positively about this initiative of the Australian Heart Foundation.

The products bearing the logo are not necessarily more expensive than comparable products. However low-fat meat and meat products are usually are more expensive.

Research among consumers has shown that the logo is widely known and well understood. The sales of logo-marked products have increased. Although industries are free to develop their own logos, so far they have not felt the need to do so. It is generally seen as an advantage that the logo is administered by an independent and non-commercial organization.

C. Kistemaker (Netherlands) presented the results of a study in which a model was tested that can predict the effect of substituting in the diet high-fat products for low-fat products. It may be expected that using low-fat products may lead to the use of (different) high-fat products on other moments during the day.

The study, based on recent data from a large-scale food consumption survey in the Dutch population, has shown that the choice of low-fat meat, low-fat meat products and low-fat margarine has a positive effect: total dietary fat intake remains significantly below the initial level. In this study the effect of substitution in terms of total energy intake was not taken into account. However, it is assumed that the difference is too small to influence the validity of the results substantially.

It was concluded that models like this one may prove an interesting and cost-effective way of studying the effect of certain changes in food consumption. The predictability is expected to be very high.

Next, two speakers presented the experiences with the 'Let op Vet' ('Fat Watch') campaign aimed at lowering fat consumption in the Netherlands. After publication in 1985 of the Nutrition Guidelines by the Dutch Nutrition Council, P.J. Anema told the audience, the ministries of Public Health and Agriculture took the initiative to install a steering committee Healthy Nutrition. This committee was given the task to promote activities that may contribute to a reduction of the contribution of fat to total energy

intake from the present average of 40% to 36%. The project was inspired by the notion that the high fat consumption in the Netherlands is considered to be the most important health-threatening imbalance in the average Dutch diet. In the committee all parties involved cooperated, such as the government, educational organizations, the industry and retailers. After a starting period in which activities were kept low-key and no clear results were obtained, the idea of a four-year campaign was born. Generally, people seem to be aware of the necessity to lower fat consumption. The campaign aims at attracting attention, changing attitudes and, ultimately, changing behaviour, i.e. food choice and consumption.

The core of the campaign consists in a TV commercial and a brochure available in the supermarkets which is considered an important place for influencing consumers' food choice. The campaign does not discriminate between food products but attempts to make clear to the consumer that a wide offer is available from which the informed consumer can make a sound choice. Further, it is explained that a low-fat diet can be quite palatable and needs not be expensive. Research has shown that the campaign is well known to the consumer.

A retailer, N.W. Roemers, subsequently reported on the experience of his company with the campaign. It had been stated at the start of the campaign that retailers are not responsible for consumers but that, on the other hand, healthy and long-lived consumers are better customers. Therefore, apart form any doubts about moral obligations, there are commercial reasons to cooperate in activities aiming at improving the consumer's food choice. In the campaign period, in the month of March, some healthy products were advertised thorough the same tools that were regularly used for advertising. It appeared that advertising had hardly any effect on sales. This result may be considered disappointing and unexpected. However, it was concluded that the campaign's duration was too short to allow for more striking results.

It is assumed that this type of action may increase consumer awareness of healthy products. On the long run this may lead to changes in food choice.

T. Sharp (UK) highlighted the problems and possibilities related to health choices. The first requisite is scientific consensus on what a healthy diet is. This requisite is met more successfully now than in the recent past. Further, the message must be clearly understood. The complicated scientific truth is hard to translate in easily understandable consumer information. Next, the producer must have sufficient freedom to advertise his products. Especially when regulations pertaining to claims are too rigid, it may be difficult to convince the consumer of the importance of a given product for a healthy diet.

For producers (and consumers) the costs of product improvement are of great importance. Sugar and fat are attractive, tasty and cheap ingredients. Substituting these for more healthy components can influence both processing, taste and price.

In considering changes in the product formula it is important that the resulting product will still fit in with common consumption patterns. Otherwise it will prove too difficult to sell the product. Low-fat milk products, although generally considered

slightly less palatable, are good examples of successful better balanced products. Taking all this into account, novel foods can also find their place in daily diet. The speaker presented an example of a mycoprotein product.

The final speaker, H.W. Vaandrager (Netherlands) reported on the SUPER project. In five cities (Liverpool, UK; Eindhoven, Netherlands; Reims, France; Valencia, Spain; Horsens, Denmark) an educational project had been implemented. Healthy dietary habits are the main goal but, since it aims at changing life-style, other aspects are also taken into account. The project focuses on the higher socio-economic strata because these are likely to be more willing to adopt new ways of living, to be more interested in new products, and so on.

In this approach attention is hardly paid to specific products. One of the efforts made is to make information more attractive, in the form of labels, leaflets, etc. Information from the different national project is compared to discuss the result and to learn from each other's experience. At the time of the workshop results were hardly available as in most cities the project had started in the end of 1991.

Final remarks

In the short time left after the lectures had been presented the following remarks were made.

- The budget for advertising exceeds by far the budget available for education. Moreover, advertising does not concentrate on healthy basic foodstuffs, but primarily on fancy food products.
- In general, such products as potatoes and vegetables may be considered as healthy products. They are cheap as well. In education and advertisements the importance of these products should be stressed. Enhancing the preference for these products will result in a more balanced food consumption pattern.
- In practice, it has been shown to be possible to lower fat intake from, for example, hamburgers, without changing consumer preference. These possibilities should be employed more frequently.
- Assuming that the basis for healthy nutrition is laid during early childhood, nutrition education should aim at specific population groups such as mothers with young children.
- It is essential to make optimal use of the limited financial resources. The EC could play a coordinating role.

Report of the workshop 'Food and nutrition policy in practice'

E. Helsing[1] and J. Schrijver[2]

[1] *WHO-Regional Office for Europe, Copenhagen, Denmark;* [2] *Nutricia, Zoetermeer, Netherlands*

Introduction

The present workshop as well as the whole Conference is called 'food and nutrition policy'. The linking of 'food' and 'nutrition' is important for the following reasons.

If 'nutrition science' is taken to mean the science that interprets the relationship of food to the functioning of the living organism, that is, comprising all that happens to food once it is behind the lips, it is not more meaningful to talk about 'a nutrition policy' than it would be to talk about 'a digestion policy' or 'a policy of metabolism'. It is what happens to food before it reaches the lips that is of interest in this policy-making, and therefore the whole food chain and the factors that influence its various components must be included in food and nutrition policy-making theory and practice.

Food policies can exist and have existed without concern for nutrition: conversely, however, nutrition policy cannot exist without concern for food. Nutrition science has traditionally been concerned with the results of food intake, that is, the growth, health and anthropometric status of the organism, whether it is overfed, underfed or malfed. Nutrition science has thus been concerned with the relationship between consumption and health outcome. This concern has focused on the measurement and analysis of food consumption and on relating this to health outcome either through experimental or clinical research or through epidemiological research.

This information has been used for the development of dietary recommendations (RDAs) by various (inter)national bodies. These may serve in policy-making, but it should be recognized that RDAs vary among countries, serve different purposes and are sometimes misinterpreted. Further, recommendations are not static values but may and will change over time after evaluation of nutrition science and food knowledge.

Nutrition science can therefore be neatly and narrowly concerned with the human body and the events occurring very closely to it. If nutritionists, or others, become concerned with making policy based on the findings of nutrition science, it is essential to include the whole food chain and its actors into their sphere of interest. The various societal areas that will eventually influence what people put behind their lips are described in Fig. 1.

The areas are divided into (1) those that influence food supply to the consumer, (2) those that influence the quality and safety of the food directly, and (3) those that

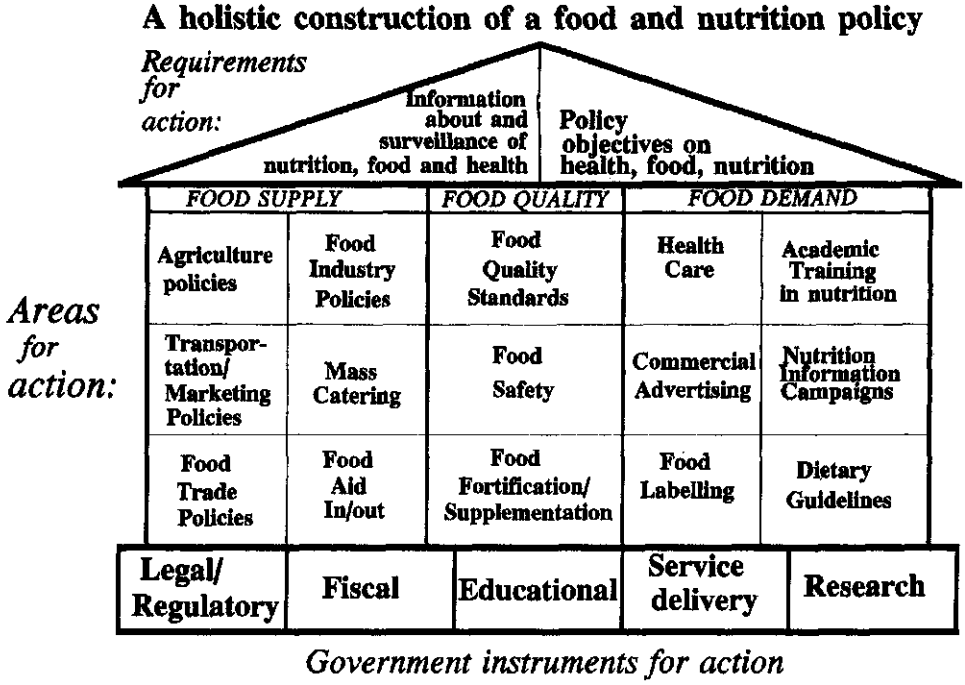

Fig. 1. The nutrition science 'building'.

influence food demand.

Not included in this graph are such factors as psychological and mental influences, tradition, culture and social relations. The reason for omitting them is not that they are not equally important, but rather that they are less amenable to policy intervention.

The 'building' in Fig. 1 is founded on the types of action normally available to policy-making, that is, legislative and regulatory action, information and education, fiscal policies and the delivery of goods and services. Surely, activities in all of these areas will be going on regardless of whether or not the country has a food and nutrition policy. There may also be considerable concern for health or nutrition in some or many of the areas, even without a concerted policy being put behind it. There may even be a considerable effect on health through the above. So why bother about specific policies?

The simple reason is that when a country declares its intention to have a food and nutrition policy, either by Parliamentary or Governmental action, it will also have to set the objectives for policy: what is it meant to achieve? The level of specificity of such objectives varies among countries, perhaps depending on their resource situation, (for example whether they are net importers or exporters of foods) or on the existing

food situation. The objectives may be given in the form of nutrient or food groups, they may be quantitative or qualitative. They may be concerned with foods or the effects of foods. In Fig. 1 the objectives make up half of the 'roof' of the food and nutrition construction.

The advantage of having specific objectives for policy is that the food industry, educators and nutritionists alike then have standards to go by. Usually these standards will have to be revised periodically. Also, they are indicative and not absolute: no one is going to be punished if they are not met.

They should be based on science and at the same time on what is realistic and feasible. In order to know what is realistic and feasible, it is necessary to know what the current situation is. Hence the second half of the 'roof' of the food and nutrition house is monitoring and surveillance of the food and health situation.

Such monitoring serves several purposes: apart from helping to formulate objectives, it indicates how the dietary pattern and health situation changes over time, and helps planners in seeing trends and levels. It can identify risk groups that may need specific protective action, and is usually also of interest to the general consumer, who gets an idea of how the food patterns are changing.

Who may benefit from food and nutrition policies? Planners in food production and food manufacturing industry certainly do. The policy objectives would define for them, on a national level, what trends and levels of future consumption might be. Educators benefit in that they can be concrete in their messages about food. And last but not least, the consumer may benefit in that the foods available and the messages given about them are making a healthy choice of diet easier to make.

Report

Presentations

1. Introduction / E. Helsing, Copenhagen, Denmark
2. Food and nutrition policy: the Dutch experience / S. van Hoogstraten, The Hague, Netherlands
3. The nutrition programme under the auspices of the Spanish Ministry of Health and Consumer Affairs / M.H. Gutiérrez, Madrid, Spain
4. Reconsideration of food and nutrition and health policy: A challenge for Kazakhstan / T. Sharmanov, Alma-Ata, Kazakhstan
5. Food and nutrition policy in Ukraine today and in perspective / G. Khodorovsky, Kiev, Ukraine
6. National food an nutrition policy in Hungary: Standpoint of the Nutritional Working Committee of the Hungarian Academy of Sciences / G. Biró, Budapest, Hungary
7. Food and health: the experts agree / G. Cannon, London, UK

Cancelled: Nutrition policy agendas / U. Kjaernes, Lysaker, Norway

The linkage between food and nutrition in policy of the workshop was introduced by Elisabet Helsing. In relation to policy-making the term 'nutrition' would comprise all

that happens to the food before it undergoes digestion by the consumer. This, then, comprises the whole food chain and the factors that influence its various components. Nutrition policy is, by this definition, basically concerned with food. Figure 1, the 'food and nutrition house', illustrates the various action areas that eventually influence what people eat. A nutrition policy works quietly on the supply side and the demand at the same time.

The presentation of national food and nutrition policy in practice by representatives of various countries ranged from an account of the Dutch experience (S. van Hoogstraten), where nutrition policy-making has gone on for almost a decade, to countries where policy-making in general is still in an experimental stage, such as Kazakhstan (T. Sharmanov) and Ukraine (G. Kodorovsky).

Between countries large differences exist in food and nutrition policy development and status, although it is generally recognized that there is a relation between food, nutrition and health. It is not always clear if and how goals are set regarding the food and nutrition policy. Priorities will, of course, differ among countries, depending on the availability of basic food products. There is sometimes a lack of communication between nutritionists and those responsible for food industrial developments on the availability of foods of good nutritional quality (low-fat dairy products, vegetables that are fresh or well preserved, etc.). Deficiencies in one country are contrasted by abundance and the resulting indulgent consumption patterns in others.

Reliable and scientifically solid methods for surveillance of diet and nutritional status assessment are sometimes not known or applied, indicating the need for an intensified global cooperation.

The Dutch experience has been one of a steady broadening of the scope of policy activities, with due consideration to the need for adjustment, sometimes compromise, and a broad multi-sectorial collaboration characterized by pragmatism, rather than audacity or obtrusiveness. It is a good example of covering most elements that should go with an integrated food and nutrition policy (as indicated in Fig. 1).

Of special concern are the compliance of agricultural policy with food and nutrition policy (foods for a healthy diet), and the need to safeguard the special nutritional needs of the aged.

Hungary (G. Biró) and Spain (M.H. Gutiérrez) are in the planning stage, both aiming at multi-sectoral collaboration, with all the difficulties that this entails.

Hungary has the advantage of political attention and support, but also the disadvantage of the still continuing struggle with basic structural problems in agriculture such as land ownership and production/manufacturing aspects. Nutritional guidelines have been developed, risk group assessment, surveillance and creation of a food data bank are being carried out, while training courses on nutrition for primary school teachers have started in 1991. The need for new food formulations of better nutritional quality and for safety control are recognized. The establishment of an independent nutrition board is expected.

Spain is at the stage of situation analysis and identification of key actions and of planning. The present nutrition programme is mainly targeted towards promotion of

healthy nutrition habits, with special attention to schoolchildren, the aged and drug addicts. There is collaboration with the food industry mainly in establishing food legislation. In the near future a National Nutrition Commission will be created in which participation of various ministries is secured, and also of the food and consumer associations.

Kazakhstan (T. Sharmanov) and Ukraine (G. Khodorovsky) are still grappling with the dissolution of the former USSR and its economic and food supply system, and finding out how to go about describing the food and nutrition situation. Kazakhstan clearly shows one-sided food habits. Food safety is questionable while the lack of variety in the food supply points to the need for an integrated approach, so that policy development should start as soon as possible. Besides one-sided diets and a substantial lack of basic foodstuffs, the Ukraine is also faced with financial constraints. Both countries need a strong support with regards to the methodology of dietary survey, of epidemiology, as well as food technology throughout the food chain.

Finally, the panel reverted to the basics of policy-making: the formulation of objectives and goals of food and nutrition policies. A very comprehensive report on expert advisory board statements on food and nutrition recommendations was presented by its author Geoffry Cannon of the National Food Alliance (London). His paper showed a large degree of expert consensus throughout the past generation that often escapes the public, which somehow is made to believe that there is constant disagreement between nutrition scientists.[1] In total, one hundred authoritative scientific reports with recommendations on food, nutrition and public health published throughout the world had been critically reviewed and analysed. The analysis showed a fair agreement on the relation between diseases and nutrition habits, resulting in what really amounts to remarkable consensus on general dietary guidelines: the availability and production of the foods that would unobtrusively contribute towards a healthy dietary pattern. The recommendations are unanimous as far as nutrition science goes, but are often unclear as to who the ultimate user of the advice is: scientists, policy-makers, food producers or consumers.

The discussion showed that there is a need for clearer definition of terms, for the precise use of quantitative figures in the recommendations, but also that there is a broad consensus as to the need for setting clear goals and objectives in nutrition policy-making, to enable nutrition surveillance and policy adjustment as conditions change.

[1] G. Cannon, Food and health: the experts agree. An analysis of one hundred authoritative scientific reports on food, nutrition and public health published throughout the world in the thirty years between 1961 and 1991. Consumers' Association, London, 1992. ISBN 08520 24495.

Report of the workshop 'Legislation'

M. Fondu[1] and O. Korver[2]

[1] *ILSI Europe, Brussels, Belgium;* [2] *Unilever Research, Vlaardingen, Netherlands*

Introduction

1. People do not eat proteins, carbohydrates, fats, vitamins or the like, but rather foodstuffs, mostly in the frame of meals. The wholesomeness of these meals is perhaps the first request the consumer has. Although every one speaks about this concept, it is not easy to define what it means or what is its contents. Harmlessness and nutritional value are two key elements in this concept which are closely related. To favour one aspect at the detriment of the other one would lead to imbalance.
2. In Europe, various countries have produced dietary recommendations. WHO Europe has issued its own document. Recommendations are comparable in Western countries, but the Southern countries insist on the value of the Mediterranean diet. No document on an EEC level has been brought forward until now.
3. Wherever such recommendations have been made, the key question is how to promote them.
   – Do we have to use regulations?
   – Should we label adequately (it is already a regulation) and inform and educate properly?
   – If a regulation is used, in what cases?
   – Do we need regulations for salt, iodine, fluoride? And for what food products?
   – Should we regulate vitamin enrichment? In some countries? For some foodstuffs?
   – Should we regulate the level of fat, sugar or fibre or rather provide the possibilities for the industry to produce foodstuffs containing less fat, less sugar and more fibre?
   – Do we have to make some regulations more flexible to allow 'fancy' products such as high-PUFA cheese?

Report

Before the discussion on this topic – the possible use of legislation as a tool to realize a more adequate supply of nutrients to the consumer – started, the context in which such legislation is to be applied was reviewed.

1. The climatological, agricultural and cultural diversity in Europe means that the nutritional needs of the population are met in a variety of ways. Even in areas

having access to the same raw materials methods of preparation of food vary widely. This implies that practical (not theoretical) legislation related to nutrition, when covering a number of countries, cannot be based on the idea of regulating every detail. The EC Maastricht treaty with its principle of subsidiarity ('In areas which do not fall within its exclusive competence, the European Community shall take action only if and inasfar as the objectives cannot be sufficiently achieved by Member States') fits in with an EC legislation that covers primarily safety, adequate information and the control mechanisms.

2. As a consequence of the free circulation of food, the old concept of regulations based on recipes (food composition), to guarantee the consumer a certain level of food quality, has been substituted for the idea that if a foodstuff is legally produced and sold in one EC country, it may circulate freely in the other ones even if the same denomination covers compositions which may differ from country to country, insofar as the information on the label is clear enough to avoid any confusion among consumers when they take the decision to buy. Therefore the harmonization of national regulations with respect to recipes within the European Community does not exist any more. This does not imply that nothing is being done regarding nutrition. The EC Scientific Committee on Food has started to establish RDAs for vitamins and oligo-elements. Regulations on food for special purposes are in preparation, and some of these have already been completed. A draft document on food supplements has been prepared and the Scientific Committee on Food has managed to develop general nutritional objectives.

3. To make the largest possible proportion of the population apply the nutritional guidelines and thus make these individuals, hopefully, more healthy, there are at least three tools that can or will be used in combination: *education, information and legislation.*

4. Legislation is the easiest way for governmental agencies but can be a harsh and rigid tool at the same time. Taking into account the fact that research (on nutrition and technology) is constantly modifying concepts and products, any regulation foreseen has to be flexible.

5. Two specific cases have been examined and discussed at great length, viz. denomination of food and food enrichment.
   5.1. New techniques have made it possible to substitute in a foodstuff one ingredient for another, at least in part, thus making this 'novel food' more attractive from a nutritional point of view for some segments in the population. This holds, for example, for high-PUFA cheese and soya cheese. *New* ingredients can be used to replace, fully or in part, existing ingredients. Would it be acceptable to have as denomination a mycoprotein meat?
   With those different – and in some cases extreme – examples in mind, the Workshop has arrived at the conclusion that some flexibility in the utilization of existing

denominations should be made possible, but that a case-by-case, product-by-product discussion would be needed to ensure that both the requirements of a modern nutritionally favourable food supply and the expectations of the consumer are taken into consideration. (During the discussion it was brought forward that such expressions as'consumer interest' and 'consumer protection' are used too frequently when the real argument is farmer or producer interest.) It was suggested that it would be useful to form a forum for examining national composition laws and their relation to denomination with respect to their possible impeding effect on the development of products that could aid the realization of a diet that helps individuals achieve nutritional objectives.

5.2. The second topic discussed was that of food enrichment with vitamins, oligo-elements or ingredients whose vitamin content has been raised through either genetic selection or genetic manipulation. A large majority of the participants agreed that in this field a certain form of control is needed which can vary from country to country and even from product to product.

Strict regulation: obligation or authorization to add iodine to salt, and obligation of addition of vitamin A and or vitamin D lo 'light' margarine to achieve the levels seen in normal margarine.

Notification of the local authorities or strict regulation for the addition of vitamins and oligo-elements.

It was also suggested that discussions should be initiated on these questions in a forum made up of governmental officials, consumer representatives, producers, trade and nutritionists. It was laso strongly recommended that the producers inform national authorities on additions of this kind so that national food composition tables can be adapted easily and timely.

Report of the workshop 'Intervention strategies'

Katarina Babinská

Research Institute of Nutrition, Bratislava, Czechoslovakia

Introduction

The nutrition policy-making process in Europe has been moving fast forward in recent years. Even though elements of a nutrition policy have already been in place in most countries ranging from a national nutrition policy existing in a few countries to small-scale projects with only limited impact, there is nowadays general agreement about the necessity of a comprehensive nutrition policy.

The rationale and background for an intervention have already been spelled out in several international fora, and the main goals have been set up. Since that time the nutrition policy-making process in Europe has proceeded from the early period of problem identification and definition of essential elements in further policy development to a more advanced stage characterized by strategy preparation and first steps towards its implementation.

With respect to a number of sectors and institutes dealing with aspects affecting the food and nutrition situation a multisectorial approach is seen as the most effective choice. Different actors with roles and responsibilities in food availability, food quality, knowledge of food and other qualities are involved, but their activities are directly or indirectly oriented towards central subjects in nutrition intervention (individuals, groups or populations, whose special position results from the primary goal of a policy) to serve the health interests of the population.

The objective of any action or policy measures regarding people's eating habits is to ensure that as large a proportion of the population as possible adopts consumption patterns in line with the policy guidelines to avoid risks. On the other hand, it is not ethical not to discriminate between people being and those not being at risk, which may result in some people changing their habits who had no need to do so and a concomitant unnecessary and undirected arousal of anxiety. Therefore it is reasonable to ask a question: to whom should a nutrition intervention be directed?

The need to draw up comprehensive food and nutrition policies or strategies has been evoked by the extent of the major health problems in affluent European societies – non-communicable diseases, especially coronary heart disease (CHD) as the disease with the highest human cost. Most cases occur among the large proportion of the population with moderately elevated risk, not among the smaller groups at comparatively high risk. Thus, from intervention options including population strategy

and high-risk strategy, the former has been recommended and subsequently broadly accepted in several nutrition programmes.

However, a weakness of many nutritional programmes has been found in the fact that the population was considered to be a homogeneous group. Therefore many of these programmes failed or had only limited effect. As an alternative to the population approach, the risk-group strategy appears to be the method of choice in nutrition policy.

Risk group strategies have received a more prominent place on the agenda recently, in particular in Eastern and Central European countries. Non-communicable diseases represented nutrition-related problem Number 1 within a policy formulation. In the past few years a new nutritional problem has become apparent, namely the formation of vulnerable groups at risk for insufficient nutrition. In the light of this evidence, the possibility of a high-risk strategy is being considered. The generally accepted CHD population strategy is being complemented with new aspects because tackling of problems of specific groups is inevitable.

Another reason for discussing a high-risk approach has arisen from findings of some studies which have analysed risk factors of CHD in a more complex way. They have shown that nutritional risks, together with non-nutritional risks, are clustering within population subgroups, thus resulting in identification of individuals and groups at higher risk, in which the risk group approach, possibly in addition to a population intervention, might be reasonable.

Bearing in mind efficiency and effectiveness of intervention, also social and ethical issues should be considered. In this concept several serious questions arise in the decision for or against a risk group strategy: which criteria to choose for risk group identification, what is the size of a group, how to cope with different messages for particular groups, and many more.

Besides the issues mentioned above, which can be summarized as 'what makes sense for decision-makers', the opinion of the actual beneficiaries, and at the same time the contributors to the policy action, i.e. the public, must be taken into account.

In general, considerations about a nutrition policy importance of communication between policy-makers and the community, as well as with all actors involved in an intervention, are stressed in order to create a climate and opinion conducive to the development of the policy.

The active involvement of the public reminds us that not only scientific approval and economic feasibility are important factors, but also social acceptance. Cultural and individual factors and, even more so, ethical issues must be given due respect.

Even if an intervention is perfectly organized at the level of food production, or food safety, to achieve the desirable effect public support is indispensable, and vice versa. It may be unethical to sensitize a population and then put obstacles to the health-conducive approach of people, for instance through limited food choice. Thus, it seems reasonable to monitor public opinion and to include it in a baseline approach for policy development.

This brief introduction indicates a broad spectrum of questions arising when decisions about the role of public, and the approach to the public within a policy are

made. Even though the main goals of nutrition policies are very similar, diverse conditions in European countries result in several possible ways to reach them. The aim of this session will be to share experience, to shed more light on this topic, and to summarize options for the planning of future strategies.

Report

A wide choice of proposed issues provided an open forum to debate aspects of two selected topics relevant to food and nutrition policy design: selection of target groups and public support for interventions.

Current knowledge and experience give us a picture of the complexity of nutrition interventions. The analysis and evaluation of policies reveal a wide range of factors of importance in the decision-making process.

The lectures presented in the workshop session 'Intervention strategies' stressed that notion. Each of four presentations pointed out different aspects of a strategy for a nutrition programme. They reminded the participants that the choice of an intervention strategy is an advanced step in policy-making. Thus, a discussion about whether to decide for a group strategy or for the population approach has to be preceded by a lot of preliminary work such as summarizing the state-of-the-art, collecting data on the nutritional status of the population and identifying possible confounding factors. The aim of the discussion was to debate main issues of the presentations in the light of the choice of either target groups or the population as a whole.

The lecture about the French paradox dealt with a particular approach in assessing fat consumption, meal patterns and cardiovascular disease. A comprehensive study has focused on the relation between major health problems in Europe and nutrition. The study met fair scientific support for the implementation of healthy nutrition promotion programmes or policies. Evidence of a relation between fat intake and diseases of affluence is accumulating. A decrease of fat consumption takes a top position among the goals of nutrition programmes. However, our present knowledge still suffers from gaps and controversies. More research and new methods are needed to clarify particular problems. The key question is to what extent new results of surveys will change currently accepted theory on the role of fat in diseases of affluence, and thus influence the goals of nutrition interventions. The appropriateness of the message to be sent to the public was discussed to avoid confusion and to prevent a nutrition intervention programme from being discredited.

The discussion stimulated by the Dutch contribution focused on the implications of the food and nutrition situation in population groups for making strategy decisions in nutrition intervention. The presentation served as an example of how analysis and evaluation of nutritional status data can help select a strategy – in the case of the Netherlands a population-based approach. It was stressed that the pros and cons of either approach can create a very narrow borderline, especially with regard to particular nutrients. Other factors, such as socio-economic status, the feasibility of an intervention and the sensitivity of the target group, must be taken into consideration, which may be supportive in selecting the approach that is most likely to be effective.

Priorities of nutrition goals were discussed.

Nutrition-related problems in developing countries differ substantially from those in developed countries. The Moroccan contribution exemplified the fact that, in spite of differences in problems and goals to be achieved, there are many similarities both in the actual approach of nutrition intervention projects and in their design. It was pointed out that the experience with a high-risk group strategy in a developing country is a reliable source of information for developed countries as well. Possible shortcomings in the Moroccan programme, resulting in a limited success, were discussed. The importance of proper indices of risk was stressed, as well as the selection of criteria for functional classification which would identify individuals at highest risk with sufficient sensitivity.

A multisectorial nutritional policy is a complex mechanism implying the involvement of many different bodies – the industry, trade, nutritionists, the general public, and so on. In the last lecture attitudes of particular actors towards a health-oriented project were discussed. The discussion aimed at identifying the role of economically driven actors, such as the industry or distributors, in order to put healthy nutrition promotion projects on their agenda. Possibilities of government measures were considered as well as the impact of pressure groups.

The lectures as well as the discussions were most stimulating and undoubtedly shed considerable light on the many issues related to nutrition intervention strategies. The session most certainly has been a source of inspiration for those participants who are actively involved in food and nutrition policy-making.

Report of the workshop 'Nutrition education for professionals'

M. Gibney[1] and G. Hiddink[2]

[1] *St. James Hospital, Dublin, Ireland;* [2] *Stichting Zuivel, Voeding en Gezondheid, Maarssen, Netherlands*

Introduction

Governments and public authorities have the responsibility to promote good nutrition and public health in their countries. In order to reach this goal governments should encourage health and other relevant professionals to play an active role in nutrition education for the public and in schools as part of promotion of a healthy life-style and prevention of diseases as well as stimulate national and international programmes for nutritional training at different levels.

This workshop lies within the frame of the programmes for nutrition education in the context of health promotion for the European Year of Nutrition in 1994. The importance of nutrition education and examples of European conferences or courses can be shown. Participants will be able to discuss the role of national governments and the EC in developing further policies in this area.

The area of Nutrition Education includes initial education in schools and general education of the public. Initial education in schools includes the education of 4–18-year olds or initial vocational training of nutrition or health education professionals at lower, intermediate and higher levels. In-service training of these professionals should be included for those who have already finished their school training.

A workshop on Nutrition Education within this Food and Nutrition Policy Conference could have the following goal. Participants should be provided with an opportunity to effectively place nutrition education to promote a healthy life-style in the context of Food and Nutrition Policies in Europe by:

- identifying the educational aspects of different food and nutrition policies of the different countries in Europe;
- placing these aspects within the health and educational policies in Europe;
- reviewing the different initial nutrition or health education programmes for 4–18-year olds in schools in different European countries;
- considering the different programmes for in-service training of nutrition or health professionals on a national and a European level;
- discussing European programmes to develop nutrition education in schools and for the general public;
- making recommendations to national governments and the EC for nutrition

education in the context of a healthy life-style;
- making recommendations on a national and a European level to school administrators, communities, national governments etc. for selling and offering food and drinks in the school;
- what aspects of nutrition and health should be taken into account in training or education of nutrition or health professionals and general teachers?
- should there be special nutrition programmes in schools or should they be implemented in the general programme?
- should there be special nutrition teachers or should nutrition and health be a regular part of the training of general teachers?
- do professionals play an essential role in the success of health-promoting nutrition programmes?

Report

Nutritional knowledge among medical practitioners is poor when measured objectively. Their perceived knowledge is high, and it is this discrepancy that is most worrying. The curriculum of undergraduate medical schools leaves little space for nutrition, and efforts to broaden this space meet with competition from other disciplines which feel a need for greater inclusion. There is, therefore, little basis upon which to believe that preventative nutrition knowledge will be made possible in the future in what are essentially curative technical medical curricula.

Given these constraints, two facts must be accepted. First, medical practitioners will never become nutrition experts, no more than they can become experts in sports medicine, genetic counselling, occupational health, and so on. The best we can hope to achieve is to narrow the gap between their perceived knowledge and their actual ignorance. This could be done through postgraduate training and vocational training. Second, dietitians must play an increasing role in primary health care. If that is accepted a number of policy issues arise. One of these is the upgrading of the training of dietitians in those countries where their skill level confines them to a low level of responsibility in hospital catering. A second issue is the necessity for health care systems to pay for dietetic advice following referral by general practitioners.

With regard to other professions, an increased nutrition content of their training programmes is necessary, in particular for allied health professionals such as nurses. However the same constraints apply here as for the medical profession. Nurses cannot be experts in everything including nutrition. Thus postgraduate training of non-medical professionals is essential. This should be done by community dietitians whose training should be at post-graduate level and should have a heavy element of communication skills.

Report of the workshop 'Nutrition labelling and claims'

D. Richardson

Nestle UK Ltd., Croydon, UK

Introduction

Nutrition labelling and the use of nutrition and health claims are potentially the most significant food policy issues. Scientific investigations have now demonstrated important associations between dietary habits and the prevalence of chronic diseases, and at the same time it has been shown that Western diets are excessively abundant in such components as energy, total fat, saturated fat and sodium. Consumers whose interest in nutrition is awakened will look increasingly to the food label to supply understandable, relevant and consistent information. Nutrition labelling and claims could play a significant role in providing all consumers with information about the nutrient content of the foods they eat. However, the information should not falsely describe the food or be misleading as to the nature, substance or quality of the product.

The goal of the workshop was to consider the views and experiences expressed during the presentation of five papers and in the general discussion and to assess the implications for nutrition policy makers in government, academia and industry. The workshop undertook to examine:

- the feasibility of various systems of nutrition labelling including the use of graphical or other simplified visual formats,
- the format of nutrition information,
- to what extent nutrition labelling and claims should be voluntary or mandatory,
- the application of nutrition labelling to loose and fresh foods,
- analytical considerations such as agreed methods and conversion factors,
- tolerance and enforcement considerations.

Report

Definitions

Nutrient declarations: standardized lists of nutrition information about food including quantification per 100 g and/or per serving (e.g. energy; protein; carbohydrate, of which sugars; fat, of which saturates; dietary fibre).
Nutrient claim: any presentation which states or suggests or implies that a food has a

particular nutritional composition (e.g. low fat, reduced sugar, high fibre).
Health claim: claims about the effects of foods on physiological conditions and specific diseases (e.g. can help lower blood cholesterol). It was noted that claims as to the suitability of a food for use in the prevention, alleviation, treatment or cure of a disease, disorder or particular physiological conditions are prohibited.

Basic principles and problems

Harmonisation. Regulations concerning nutrient and health claims vary form one country to another, and many problems can arise for food manufacturers and enforcement authorities owing to the lack of harmonisation. There is a great potential for consumer confusion if terminology and formats are not defined. Differences are evident in methods of analysis (e.g. dietary fibre); variations in dietary reference values for macro- and micronutrients; definitions of 'low', 'reduced', 'high', 'rich'; reference points for nutrients per 100 g, per kg, per 100 kcal, per serving, etc. For example, in the UK, 'reduced fat' means a 25% reduction compared with a standard product; in Germany, 'less fat' means a reduction by at least 40%; in the Netherlands, 'decreased fat' means a reduction by at least 33%; in the USA, 'fat reduced' is at least 50% reduction. Hence, there is a need for harmonisation of claims to: protect public health; inform the consumer; ensure fair trade and competition; provide necessary controls.

Purposes and aims of an effective labelling system should:
- provide understandable and useful nutrition information to enable people to select balanced diets and to allow individual consumers to follow recommended diets,
- be designed so that meeting nutrition goals for listed nutrients with a variety of foods ensures that the individual meets all of his other nutritional needs; help the selection of foods at the point of purchase,
- stimulate nutrition education,
- present information in a uniform and consistent fashion,
- be consumer-oriented and meaningful,
- be quantifiable and hence enforceable,
- be applicable to a wide range of foods.

Regulations on nutrient and health claims should:
- ensure that information on food labels does not overemphasise or distort the role of a single food or component in enhancing good health,
- recognise that health claims and statements on labels and promotions can be an important way of conveying facts to the public provided that there are sufficient controls and guidance to avoid furnishing misleading information. The basic problem is how to allow valid, appropriate health claims and statements without opening the door to misleading and fraudulent claims, and to ensure that disease prevention and health benefits are founded on, and are consistent with, widely accepted, well substantiated, peer-reviewed scientific publications.

Further observations

- Food manufacturers and retailers will utilise nutrient and health claims as valuable marketing tools in their eagerness to please the customer and to promote new product developments. Manufacturers have responded by producing a wide range of foods for healthy eating and by labelling their products voluntarily. Many nutrition claims are already regulated and they trigger off nutrition labelling in a format consistent with the EC Nutrition Labelling Directive.
- Nutrition claims and certain compositional components do influence food choice (e.g. growing market share of low-fat products).
- Nutrition labelling should be part of a broader programme to educate consumers to make informed and wise choices.
- A major criticism of nutrition labelling is its complexity. There are now several suggestions to supplement numerical nutrient declarations ranging from pictures and symbols to systems categorising products into 'high', 'medium' and 'low' with respect to certain nutrients. These 'banding' and 'verbal' descriptive systems have considerable merit and require further research.
- Food labelling and claims are important food policy issues requiring cooperation between all those concerned with food and nutrition. Food manufacturers could benefit by communicating nutrition in their product development and marketing strategies so that consumers can make informed choices and enjoy the benefits that modern food technology can provide.
- Nutritionists and legislators will have to work hard to identify and harmonise the criteria for nutrition and health claims and to find effective ways to communicate nutrition messages so that confidence in the food supply chain is maintained and enhanced.

Appendix: Workshop programme

1. Chairman's introduction and overview / D.P. Richardson, Croydon, UK.
2. 'Just read the label': understanding nutrition labelling in numeric, verbal and graphic formats / M.J. Rayner & A.E. Black, London, UK.
3. The use and regulation of nutrition and health claims / M.J. Rayner, H. Lightowler & W. Hare, London, UK.
4. Nutrition and health claims on food products in the Netherlands / S.J. van Dis et al., The Hague, Netherlands.
5. Nutrition and health claims on food products in Sweden / A. Bruce, Uppsala, Sweden.
6. 'Tooth friendly': impact of a joint academic/industrial communications programme on consumer behaviour / A. Bär, Brussels, Belgium.
7. General discussion.

Report of the workshop 'Nutritional intervention (channels and integrated or isolated nutrition messages)'

Elfriede Feichtinger

Isarstrasse 8, Rosenheim, Germany

Introduction

Nutrition is only one of the components of a life-style. Other components, such as physical activity and smoking, also affect the health status of population groups, and changing life-style characteristics may influence morbidity and mortality profiles. A combination of undesirable life-style characteristics can entail a greater health risk than expected from the sum of the individual factors. Furthermore, most nutritional factors are interdependent with other dietary factors and many play a role in more than one disease. These insights may provide a basis for integrated programmes. On the other hand, such comprehensive programmes may be difficult to finance and implement, so that their feasibility may be lower than that of a single-issue strategy.

Various channels, such as schools, shops, mass media and the health care system, can be used as a vehicle for change. This may cut costs since the infrastructure exists already. However, nutrition is not their primary goal, and nutrition may receive a low priority in case of lack of time and finances. For some issues, therefore, an isolated approach may have advantages because it is independent of other sectors' interests.

Which kind of intervention will be put into action finally depends on a wide range of considerations.

If we wish to promote public awareness and attitudes towards a healthy nutrition it is reasonable to address a broad range of issues through every feasible channel. But if individual nutrition habits are to be changed there have skills to be taught or foods to be made available, requiring special strategies and closely defined subjects.

If the target group is interested and easy to address (as young mothers usually are) known communication channels for nutrition education may be used. If nutrition intervention is targeted at problem groups (as low-income, low-education groups usually are) it may be helpful to use co-operation paths which, at the first glance, have nothing to do with health and nutrition at all.

If intervention is directed to prevention and health promotion a comprehensive programme including the wide range of aspects and sectors may be appropriate, but if an existing problem has to be coped with it may be necessary to narrow down the scope of issues.

This workshop presents different types of interventions ranging from single-issue, single-channel programmes to a multifactorial and comprehensive approach.

Issues to be addressed:

- Should nutritional interventions be integrated in general health programmes?
- Should nutritional considerations be integrated with other aspects and sectors in the analysis of the situation only? If not, which integration (agriculture, health, etc.) is given priority and which kinds of integration are considered to be feasible?
- Should interventions be oriented at one nutritional issue at a time or should interventions be oriented at realizing all aspects of current guidelines?
- What are the criteria for a choice for dietary factors to be changed and for a priority for intervention programmes?
- What are the pros and cons of making use of existing infrastructure?
- What are the experiences with various channels with respect to co-operation, efficiency and effectiveness?

Report

The papers presented in this workshop clearly showed that there is no standard strategy for successful nutrition intervention and that the decision on which strategy to operate depends on many factors. Apart from heading towards a better nutrition the presented programmes are geared to different problems of preventive nutrition intervention and also to different target groups ranging from the population at large to very specific groups. Several of the programmes have been launched only recently so that long-term experience is not yet available. Nevertheless the programmes have some considerations and experiences in common which answer at least part of the main questions of this workshop.

All programmes presented collaborate with other profit or non-profit sectors and make use of their infrastructure and information channels. Major partners are the public health sector, the food industry and trade, but also the education sector and agriculture. In fact, it seems as if many impulses come from these sectors and it is important to discuss one's goals and objectives with them. This is a very reasonable approach as nutrition is a multidimensional phenomenon and very likely any nutrition programme will touch upon other sectors' interests. Neglecting this may cause disturbing interferences instead of a successful nutrition programme. Moreover, collaboration with other sectors may have a synergistic effect.

Integrative planning prevents varying or conflicting messages giving the impression that nutritionists constantly disagree about their recommendations. Nutrition information will become more reliable in the consumers' eyes. Co-operation also helps identify realistic goals, allows for a better use of resources and probably offers a greater variety of professional expertise than would be available to a single organization. A broader range of target groups within the heterogeneous public may be covered as most sectors or organiziations have their specific clientele. This also improves access to groups which are usually distant to nutrition education.

A basic requirement for successful collaboration with other sectors is consensus

among partners regarding necessity, objectives, feasibility and components of the programme. Cooperation programmes in which the partners meet at the lowest common denominator will stay at the surface of the problem and very likely will be of low efficiency.

Many sectors are open to collaboration. Which form of integration should be given priority depends very much on the problem to be solved and on the issue pursued. Integration with the education and communication sector will be beneficial in most interventions in which consumer information is necessary and the recommendations of nutritionists have to be communicated. Integration with agriculture and the trade sector is imperative where food supply is concerned, because it would be quite useless to direct the consumers' attention to products that are not available, not affordable or not attractive.

M. Riedstra (Netherlands) and V. Wheelock (UK) presented papers on programmes cooperating with food companies. Whereas the Dutch 'Fat Watch' campaign was started only recently and has shown mainly effects on consumers' awareness, the English efforts have resulted in a substantial increase of market shares of foods that contribute to a healthier diet.

Although all presented programmes integrate with other sectors, some of them covering a very ambitious range of issues, and although some points of contact to non-nutrition issues can be found, only the Slovak Healthy Nutrition Promoting Programme seems to consider active integration with other aspects of human life-styles such as smoking or physical activity in the form of general health programmes.

Basically, the same considerations as for intersectoral intervention programmes are applicable to general health programmes. Nutrition and nutritional behaviour are closely connected with individual and societal life-styles, a fact that is possibly better taken into account by general health programmes than by specific nutrition programmes. This might be a consequence of interdisciplinary cooperation which sometimes might be easier in more general approaches than in nutrition programmes which usually have a tendency to act from a strictly biomedical point of view.

On the other hand, many general health programmes remain inefficient because they are trying to cover too many issues, are not tailored closely enough to the individual needs of the members of the target groups and, all to often, do not even differentiate adequately between target groups to really appeal to them. Real changes to better dietary habits beyond a rise of public awareness might not be found.

But also thoroughly planned and promising general health programmes take their time until results can be shown. If a problem requests rapid coping, affects a specific group or is closely defined, a different strategy will be needed. This leads to the question what dietary factors should be addressed by intervention programmes.

The most obvious criterion to select a specific factor for nutrition intervention is sound epidemiological evidence that a food component entails a health risk for the population or parts of it. There also should be sufficient evidence that the problem can be prevented or mitigated by a change of nutritional habits or food composition. Apart from epidemiological reasons, it depends on social, political, economic and – last not

least – ethical considerations what priority a problem will be given for intervention. The actual scope of dietary factors in interventions is determined very much by the aims and purposes of the organizations involved, by the available resources and even by the professions of the personnel involved.

This may result in very comprehensive programmes such as the Slovak example presented by K. Babinská (Czechoslovakia) which covers more or less the whole range of nutritional issues and target groups, or in a programme that concentrates mainly on one special aspect such as the Polish Children Nutrition Policy presented by Z. Rudzka-Kantoch (Poland).

Irrespective of whether intervention programmes focus on one nutritional issue or on all aspects of current guidelines, it should be kept in mind that, where individual eating habits are concerned, changes are easier to achieve using a step-by-step strategy. The all-at-once method is more likely to cause educational overexposure which will be a nuisance to the public.

Usually intervention programmes are well aimed from the biomedical point of view and their messages, if communicated in an appropriate way, may be accepted on the intellectual level. However if these messages are oriented only to the symptoms and miss the underlying psychosocial, sociocultural or economic causes which may contribute to poor nutrition, they are of no real relevance to the addressees and will not be incorporated in everyday life.

For this reason it is evident that any nutrition programme will probably have to take more than one single issue into account, not all of them being nutritional issues on the first glimpse. E. Dowlwer (UK) suggests that at least for low-income households, whose members are most prone to nutrition-related diseases, strategies to raise the women's incomes and improve maternity benefits may be the most effective nutrition intervention among current consumer choice approaches.

Report of the workshop 'Nutrition education to the public'

B. C. Breedveld

Netherlands Bureau for Food and Nutrition Education, The Hague, Netherlands

Introduction

Nutrition education is the meaningful interpretation of knowledge about nutritional issues with the aim to influence dietary behaviour. Strategies for change can be directed at individuals or groups (providing appropriate and usable information, motivation and behaviour change techniques) and at the 'environment' (supply of food, point-of-purchase nutrition information, etc.) of consumers. There are some indications that nutrition education is becoming more complex due to more heterogeneous food consumption habits within countries, introduction of new and conflicting guidelines, (implicit) claims for specific food products, rapid changes in supply and demand making knowledge of nutrient composition temporary, urbanization and commercialism. In many European countries 'classical' characteristics such as socio-economic and demographic factors are less predictive for food choices than a few decades ago. Other factors, such as attitudes and time expenditure, may be more predictive, but these are less practical than, for instance, age or region.

Issues to be addressed:

- In what way should nutrition education respond to demographic changes such as a growing proportion of the elderly population?
- Is nutrition education becoming more complex? If so, what are the factors responsible for this?
- What aspects of consumer behaviour and of the food system should be studied to design effective strategies in a variety of settings (schools, food stores, etc.)?
- How can nutrition education be individualized?
- For what goals are messages like 'eat a variety of foods' effective?
- What parts of nutrition education should be tailored to the needs of specific groups?
- Should nutrition education be oriented at 'teaching' how to get and use nutritional information combined with stimulation of its usage, or should it be oriented at just providing the information?

Report

The first presentation by Ms J.M.P. Edema was entitled 'Food and nutrition policy

and democracy: food consumption surveys in the quest for better nutrition'. The speaker noticed that the Dutch government relies on nutrition education and rejects differential food pricing as being undemocratic in that it could bring some foods outside the reach of the lower socio-economic groups of society. This implies that nutrition education should not be undemocratic. The democratic character of nutrition education depends on the scale and type of information offered. Ms Edema stated that people with a more general education are more inclined to accept new ideas. The democratic character also depends on the way guidelines for a healthy diet are translated to the public. Most people are unaware of the scientific background of fats so that their attitudes and behaviour are based on their own – probably 'false' – interpretation in terms of food choice. Therefore, the educator's message should be on the level of products. Ms Edema also presented a 'scheme of culture' which visualized that there are different patterns and events of food consumption. These patterns should be analysed on socio-economic and socio-cultural background before sensible policy-making is possible on such items at pricing policy.

The second lecture was presented by Ms S. Palmer who gave an impression of the preliminary results of the evaluation of a television programme on healthy nutrition named 'Eat smart'. The impact of this programme on nutrition knowledge, attitudes and behaviour had been measured. The main conclusion emerging from the longitudinal evaluation of the programme was that income, education, gender and professional occupation have an important and largely predictable influence on nutrition knowledge, attitudes and behaviour.

Although television alone does not appear to be a reliable source of nutrition education, the finding that all people interviewed showed significant gains immediately after viewing 'Eat smart' indicates that effective television programming can improve nutrition knowledge, attitudes and (at least reported) behaviour. More importantly, it indicates that these gains can be largely sustained over a longer period of time.

All in all, 'Eat smart' indicates that educational television can be used effectively to inform and educate the public about critical health concerns and to motivate and stimulate the audience to adopt healthy eating habits.

L. Stockley presented an overview of the activities of the Health Education Authority (HEA) in England in the field of direct public education. The HEA has paid attention to two main topics.

First, attention has been focused on the need for formative research, research on marketing of educational materials and research on the impact of actions on general knowledge.

The other item is the lack of money available for nutrition education and the low prestige of nutrition educators. There is only money available for preparing leaflets, posters and booklets, not for making television information programmes. The lack of money necessitates partnership with, for example, retailers' organizations and integration of activities in other television programmes. Also, cooperation between

producers, retailers, educators, the government and other parties and participation of local authorities must be stimulated. This picture matches the conclusions emerging from the workshops 'How can food producers and retailers make the healthy choices the easy choices?' and 'Intervention strategies'.

Finally, Mr Stockley mentioned some barriers to change in dietary habits. The most important one found by the HEA are cost, taste and family pressure. Another barrier generally felt is that experts disagree frequently.

Ms M. Nestle demonstrated on the basis of a clear-cut example that educational organizations must never amalgamate with organizations involved in product promotion and marketing. In the USA, the United States Department of Agriculture (USDA) is responsible not only for nutrition education but also for promotion of agricultural produce. The way a new nutrition education model, 'The Pyramid' has been worked out was a catastrophe. The main cause of this was that, in contrast with the past, the consumption of certain food commodities, in particular meat and milk products, should be diminished. As a matter od course, the food processing and trade branches only accepted a positive approach. From the educational point of view, however, this clash of interests had a strong side-effect in the form of a vast amount of free publicity.

Ms J. Hammink presented the new approach in nutrition education launched by the Netherlands Bureau for Food and Nutrition Education. The main elements of this new approach are:

- flexibility of nutrition education models such that they can be used for various target groups and subjects;
- the individual needs of the consumer should be fulfilled as far as possible.

The starting point in nutrition education are ten rules of good nutrition. These are based on dietary guidelines and recommended dietary allowances. The 'Food guide' has been developed as an aid for the nutrition educator. This education model is empty in principle and can be filled with foodstuffs depending on the item of the education. (For example, when educating vegetarians only vegetarian foods should be filled in.)

To fulfil the need for a more individual approach new technologies have been used in developing two personal computer programs. The main element of both programs is to give more insight into the consumer's own food habits.

Let me finish with some general conclusions of the workshop 'Nutrition education to the public'.

- Nutrition education is becoming increasingly complex because food choice is ever broadening, and hence confusion is increasing. Indeed, present-day society has more dietary freedom of choice than ever in history. Our greatest asset is the high level of public interest in nutritional matters. This calls for fundamental, food-based guidelines, but also for the development of education that helps people gain more information and integrate it for their own benefit.

- Unfortunately, we do not properly understand how to educate most effectively. Much more applied research into educational techniques and social science is needed. In addition, we must evaluate the educational initiatives we undertake in order to learn and evolve.
- One issue we need to investigate is whether some arguments given for not changing dietary habits (such as 'too expensive' or 'experts always disagree') are solid reasons or rather rationalizations masking more fundamental barriers to change.

Report of the workshop 'Agricultural policy, food consumption and health'

M. Nubé

Centre for World Food Studies, Amsterdam, Netherlands

Introduction

The incidence of such diseases as cardiovascular disease and cancer is influenced by the nutrient composition of our diet. Among other things, food composition and food choices are determined by the price, the availability and the composition of food. These factors in turn are influenced by the Common Agricultural Policy (CAP) of the European Community through such measures as quota and interventions. However, nutrition and health are no explicit objectives of the CAP. This workshop will discuss the effect of the CAP at each stage of the food chain. It will also focus on the CAP measures and their possible positive or negative effects on food consumption and health.

Issues to be addressed:

- The influence of the CAP at different stages of the food chain.
- Positive and negative effects of CAP on consumption of food and nutrient intake.
- The effects of CAP on the incidence of nutrition-related diseases.
- Introducing models, describing the link between CAP, effects upon market parameters (like prices and availability), effects upon consumption of food, consequences for nutrient intake, effects on nutrient-related diseases.
- Is there a need for nutrition and health objectives in the CAP? If so, in which areas?
- How could health and nutrition issues be included in EC agricultural policy?
- How could intersectorial policy be stimulated?
- What CAP options could be identified and which would be the effects upon market parameters?
- What is the influence on agricultural and food industry in CAP?
- How do consumer organizations and nutrition-related organizations like the BEUC, International Heart Network and the co-operation of European Nutrition Boards influence EC policies and decisions?
- Is additional infrastructure needed?

Report

Alan Swinbank (Dept. of Agricultural Economics, University of Reading, UK) presented an 'Overview of the food chain and the effects of CAP'. According to his opening statement, '... most citizens of the EC undoubtedly enjoy in the early 1990s a wider range of quality safe foods, at lower real prices, than at any time in history'. Nevertheless, he also acknowledged that '(1) CAP may push food prices to too high a level; (2) insufficient resources may be devoted to the safety of food supply; (3) some individuals may ingest an inappropriate diet; (4) some households may not afford an appropriate diet; (5) some car-less, and immobile, citizens may not have access to the cornucopia of products on sale in the modern out-of-town store'. Further, Swinbank stressed the fact that his presentation focuses on the effects of CAP on the situation within the EC, much less on possible effects on the outside world, in particular the developing countries. As a further introductory statement, Swinbank contended that it is the European Community's international spending power , and the world-wide growth in farm production, that determines predominantly the range and quality of foods available in our stores and that, in comparison, the CAP has a marginal impact on food supply.

With respect to CAP it was noted that it is an agricultural policy, much less a food policy, and certainly not a nutrition policy. Policy makers have until now focused in particular on 'ensuring a fair standard of living for the EC agricultural community' (article 39b of the EEC Treaty). The main mechanisms of CAP are import levies, export refunds and intervention purchases. Production is constrained through a quota system. The 'cost' of CAP to EC citizens is higher food prices and tax payments to the EC's budget. Presently proposed CAP reform includes lower intervention prices and lower threshold prices for cereals, beef, butter and skimmed milk powder, and a farmers' compensation on the basis of acreage (conditional upon a 'set-aside' of 15% of the arable land). CAP reform will in general reduce the gap between CAP prices and world prices, and the new price for a commodity will be somewhere in between. However, it is very difficult to predict to what extent CAP prices will decrease and world prices will increase. Nevertheless, the likely impact of CAP reform on the EC prices are a substantial fall in prices of cereals, sugar, milk and milk products, beef, pork and poultry. With respect to the impact of CAP reform on consumer prices, it is important to note that (1) on the average, processing and transport account for 50% of consumer prices, and (2) food expenditures as part of total household expenditures are declining. Thus, according to Swinbank, CAP reform is likely to have only a marginal effect on consumption, although the impact on certain low-income groups may be larger. From a nutritional point of view, the present CAP has probably a small though positive effect in terms of healthy eating patterns.

Spencer Henson (also from Reading) presented a paper on the 'yellow fat' market (butter, margarine and spreads). He provided in particular information on changes in the 'yellow fat' market in the UK and Ireland over the 1970s and 1980s. Price support schemes for milk in the EC are actually implemented in the form of subsidies on

butter and skimmed milk powder (SMP). Probably as a result of this system there has been a tendency for fat content of milk to increase. Over the 1970s and 1980s consumer prices for butter increased in the UK and Ireland five- to six-fold, and margarine prices increased three- to four-fold. Butter consumption dropped considerably over this period, and margarine consumption fluctuated without a clear trend (the UK and Ireland joined the EC in 1978/79). In the Netherlands, where subsidies were already in effect in the early 1970s, there were only slight changes in butter and margarine prices over this period. In 1990, prices for butter and SMP in the EC are appreciably higher than world market prices, and also much higher than in such countries as the USA, Australia and New Zealand. On the other hand, EC prices for butter and SMP are lower than in Japan and Canada. Henson also presented information on price elasticities of demand for butter and margarine. In the EC member states the price elasticities for butter are between –0.3 (France, Ireland) and –2.0 (Netherlands). Thus, in the Netherlands, a decrease in the price of butter by 1% would result in a 2% increase in consumption. In contrast, price changes for margarine appear to have little impact on the consumption of butter.

Jack Whinkler (Food and Health Research, London) presented a paper on the CAP and sugar and started to ascertain that CAP has led to artificially high sugar prices in the EC. CAP reform will result in lower sugar prices and, most likely, an increase in sugar consumption. Whinkler identified two main problems associated with excess consumption of sugar: dental caries and obesity. Obesity, on its turn, contributes to heart disease, stroke, cancer and diabetes. It was noted that dental caries is one of the world's most expensive diseases in terms of treatment costs, in Britain twice as costly as heart disease. With respect to consumers' response to changes in the price of sugar, the average price elasticity of demand is low. However, Whinkler argued that there are two subgroups in the population which are extremely sensitive to changes in the price of food. The first group are children, who consume mainly sugar-containing foods and are the main victims of tooth decay. The second group, often not included in price elasticity studies, are the food manufacturers. According to Whinkler, the latter group will respond very quickly to any change in sugar price, as they are continuously reformulating their products in their efforts to operate as cost-effectively as possible. With increasing availability of artificial sweeteners, even small increases in the price of sugar will result in a reduced incorporation of sugar in their products. It is thus in the food processing sector that, in Whinkler's view, the strongest effects of changes in the price of sugar will occur. Whinkler strongly advocates a forced increase in the price of sugar, to be achieved through decreasing sugar-beet quotas in combination with increases in support prices, thus protecting farmers' incomes but reducing production, consumption and exports of sugar. Whinkler prefers such a scheme to a taxation on sugar as the latter measure would be 'less obvious' to the consumer.

Max Merbis (Centre for World Food Studies, Free University, Amsterdam) presented a paper on the likely effects of CAP reform on food consumption patterns in the EC.

First, Merbis discussed the mechanisms of CAP at the various levels of the food chain (production, market, consumption). The analysis of the effects of CAP reform on food consumption patterns is based on a quantitative study, the EC Agricultural Model (ECAM). It is a so-called 'applied equilibrium model' in which the full economy of the EC is presented, albeit with a focus on agriculture. With respect to the 'economic actors' in the model, there are producers, consumers and national governments. For each group of actors, models (including a consumer demand system) are incorporated in the model, which represent their behaviour when facing changing economic conditions. A drawback of the model study with respect to the theme of the present workshop is that ECAM provides data on consumption of food at the consumer level in terms of expenditures, not in volumes. Information on demand for food in terms of volumes is only available at the level of marketable produce available for human consumption. It should nevertheless be noted that any change in the demand for marketable foods represents a change in the same direction of the consumption of retail level foods which are derived from these marketable foods, although the ratio between the two may not be fully known at different levels of consumption. The MacSharry plan for CAP reform is expected to result (over a three-year period) in price decreases for cereals and oil seeds by about 35%, for beef and butter by about 15%, and for dairy products by about 5%. As an indirect effect of CAP reform, prices for pigs and poultry will also fall, by ca. 20%. On the basis of ECAM, the MacSharry reform will have the following effects on consumer demand for food (in kg per capita per year): an increase in the consumption of beef (1.1 kg), pork (2.5 kg), butter (0.67 kg), protein equivalents from poultry and eggs (0.25 kg) and a decrease in the demand for fats and oils by 0.18 kg. It could be calculated that these changes represent an increase in per capita consumption of fat by 4.2 g/day (2.3%). As the increase in fat consumption is mainly in the form of animal fat, there will be a concomitant decrease in the ratio between polyunsaturated and saturated fat (P/S ratio) in the European diet. Such developments would be at odds with current dietary advice, which recommends a reduction in total fat consumption and an increase of the P/S ratio. Merbis also pointed to the fact that, in particular for meat products, a price decrease would result in an increased incorporation of these commodities in processed and convenience foods. With an increasing trends in the share of such foods in total food consumption, consumers will face increasing difficulties in assessing the nutritional quality, and hence the health characteristics, of their food basket. Merbis concluded with some remarks on the policy implications of these findings. Despite the fact that, from a nutritional perspective, the consequences of the MacSharry reform are in the 'wrong' direction, nutritional considerations do not justify abandonment of reform. Theory as well as model outcomes show that welfare increases if farmers face undistorted prices. Nutrition policy must not be exerted at the farm gate level, since this would introduce inefficiency.

Epilogue

The First European Conference on Food and Nutrition Policy, 1990 in Budapest, was a political meeting, with official delegations by all European countries. The Budapest Conference was intended to adopt official recommendations, and consequently a lot of time was spent on composing an official document. In its conclusion is was stated that Food and Nutrition Policy should be promoted through multisectorial coordination and action, involving the general public. Moreover, the importance of the continuity of efforts was emphasized.

The Second European Conference on Food and Nutrition Policy, held in 1992 in The Hague, aimed at creating an open atmosphere for exchanging ideas and for providing the participants with advice on how to implement several aspects of Food and Nutrition Policy. This means that no official recommendations will emerge from the Second Conference. However, some conclusions and overall impressions are certainly justifiable.

1. The main conclusion from the first conference was that a successful food and nutrition policy needs a multisectorial approach. In this second conference it became apparent that a multisectorial approach alone is not enough. A successful food and nutrition policy also takes into account the effects of food production on a supranational (European) and even a global scale. For instance, the simple right of individuals in westernized countries to adopt a healthy life-style with a healthy nutrition may well affect the economy of developing countries.
   In the workshop on Common Agricultural Policy (CAP) it was shown that this policy was successful for the western European farmer to guarantee his income. However, agricultural production is not balanced with nutritional needs. Although economic research, so far, has come up with some models explaining the influence of various parts of the food chain; much effort will still be needed to balance food policy on the one hand and nutrition policy on the other.
2. In the plenary session it was put forward that the agricultural production of food also affects the environment. The ecological implications of food production and, eventually, consumption will become more and more important. It is expected to be a major item of consumer concern in the near future.
3. During the session on Consumer Behaviour and Communication to the Public it was clearly shown that consumer awareness will become an important factor. However, our knowledge about consumer behaviour is scanty and definitely more research is needed.
4. During the session on Nutrition Surveillance it was concluded that surveillance needs a wider scope. Besides the description of food supply, consumption, nutritional status and nutrition-related morbidity, more criteria need to be included. Some examples mentioned were the impact on public health (and costs of public health) and the informational needs of policy-making processes.

5. The workshops were intended as the major platform for exchanging experiences. The discussions in the workshops were very stimulating. As an overall conclusion of the workshops it can be stated that some of the perceived conflicts are not as deep as we believed. For example, the strong attendance of the food industry at this conference indicates the willingness of the food industry to collaborate with nutritional science. There are now really common objectives among industry and science, namely consumer health.
6. Several countries were represented in the workshops with their efforts aimed at implementing food and nutrition policy. Although an official Food and Nutrition Policy has not been adopted in every European country, it was a real pleasure to observe that in many of these countries quite some activities are going on. In this conference the western European experience was shared with other countries in central and eastern Europe. Although our main European experience relates to the question how to deal with the abundance of food supply the principles of policy-making also apply to situations of scarcity.
7. Having the growing public awareness in mind, nutrition education becomes more and more important. New models of consumer education will be developed, taking into account the consumer's attitude and behaviour, the willingness of the industry to collaborate and the policital agenda.

Taking into consideration all the stimulating discussions during the second conference as well as the fine contributions to this book we may conclude that the momentum given during the first conference is still present and that in the near future Food and Nutrition Policy in the European area will be extended and expanded. Therefore, there is reason enough to look forward to the third conference which will probably be held in Norway.

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Theodore Ockhuizen, Chairman of the Organizing Committee

Authors' addresses

Babinská, Katarina: Research Institute of Nutrition, Limbová 14, 83337 Bratislava, Czechoslovakia
Blundell, J.: Biopsychology Group, University of Leeds, Leeds LS2 9JT, UK
Booth , D.A.: Food and Nutrition Laboratory, School of Psychology, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK
Breedveld, B.: Netherlands Bureau for Food and Nutrition Education, P.P. Box 85700, 2508 CK The Hague, Netherlands
Brown, J.: Burson-Marsteller, 24-28 Bloomsbury Way, London WC1A 2PX, UK
Castro, Arachu: Maison des Sciences de l'Homme, 16 rue Suger, 75006 Paris, France
Feichtinger, Elfriede: Isarstrasse 8, D-W-8200 Rosenheim, Germany
Ferro-Luzzi, Anna: Istituto Nazionale della Nutrizione, Via Ardeatina 546, 00178 Rome, Italy
Fischler, C.: Centre d'Etudes Transdisciplinaires, 21 rue Lauriston, Paris 75116, France
Fondu, M.: ILSI Europe, 83 Av. E. Mourier, Box 6, 1200 Brussels, Belgium.
Gibney, M.: Department of Clinical Medicine, Trinity College Medical School, St. James Hospital, Dublin 8, Ireland
Gormley, T.R.: The National Food Centre, Dunsinea, Castleknock, Dublin 15, Ireland
Heilig, G.K.: Population Program, International Institute for Applied Systems Analysis, A-2361 Laxenburg, Austria
Helsing, Elisabet: Regional Office for Nutrition, WHO Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen, Denmark.
Hiddink, G.: Stichting Zuivel en Gezondheid, Zonnebaan 12D, 3606 CA Maarssen, Netherlands
Horisberger, M.: Nestec Ltd., Avenue Nestlé 55, 1800 Vevey, Switzerland
James, W.P.T.: The Rowett Research Institute, Greenburn Road, Bucksburn, Aberdeen AB2 95B, UK
Johansson, L.: National Nutrition Council, Boks 8139 Dep., N-0033 Oslo 1, Norway
Kohlmeier, Leonore: Department of Epidemiology and Nutrition, CB 7400, McGavran-Greenberg Hall, University of North Carolina, Chapell Hill, NC 27599-7400, USA
Korver, O.: Unilever Research, P.O. Box 114, 3130 AC Vlaardingen, Netherlands.
Lambert, J.L.: Ecole Nationale d'Ingénieurs des Techniques des Industries Agricoles et Alimentaires, Domaine de la Géraudière, 44072 Nantes Cedex, France
Leclercq, C.: WHO Collaborating Centre for Nutrition
Löwik, M.R.H.: TNO Nutrition and Food Research, P.O. Box 360, Zeist, Netherlands.
Lupien, J.R.: Food Policy and Nutrition Division, Food and Agriculture Organization of the United Nations (FAO), Via delle Terme di Caracalla, 00100 Rome, Italy

Milio, Nancy: School of Nursing, University of North Carolina, CB 7460, Carrington Hall, Chapel Hill, NC 27599-7460, USA

Nubé, M.: Centre for World Food Studies, Free University, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands

Ockhuizen, Th.: TNO Nutrition and Food Research, P.O. Box 360, 3700 AJ Zeist, Netherlands

Onneweer, A.: Ministry of Agriculture, Nature Management and Fisheries, P.O. Box 20401, 2500 EK The Hague, Netherlands

Richardson, D.: Nestlé UK Ltd., St. George's House, Croydon, Surrey, UK

Schrijver, J.: Nutricia Nederland, P.O. Box 1, 2700 MA Zoetermeer, Netherlands.

Sekuła, W.: National Food and Nutrition Institute, Ul. Powsińska 61/63, Warsaw, Poland.

Sharp, T.: Marlow Foods Ltd., 9 Station Road, Marlow, Bucks. SL7 1NG, UK

Toussaint, Christiane: Bureau Européen des Unions de Consommateurs, Heilsbachstrasse 20, D-5300 Bonn, Germany