

## Organics and Functional Food / Nutraceuticals – Contradiction or complement

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### Introduction

The consciousness of the consumer in Europe, with regard to food has changed considerably over the last decades. In earlier times one ate to survive and quality of food did not have first priority. Due to lack of sufficient financial means the choice and variety of foods consumed used to be very limited. After World War II, financial means that could be dedicated to food gradually became more abundant and the European consumer focussed on food which was nutritious and supported growth. In the fifties and sixties, the tendency was to eliminate potentially harmful components from food by adding preservatives and taking better care of production schemes. Foods became a matter of research and technology. The seventies and eighties have further focussed on the elimination of potential chemicals (alcohol free beers, caffeine free coffee, etc...) and the production of energy-poor and low-fat products ("light" products). This tendency towards a technological interference in food production processes continued in the nineties. The role of diet to provide the right (amount of) nutrients to fulfil the nutritional requirements for normal body functions gradually changed towards a concept where diet can have a modulatory effect on various body functions. In this view, diet could contribute to an improved state of well being, reduction of disease risk and improve the quality of life. Simultaneously to the acceptance that specific health promoting components can be added to traditional foods, there was an evolution in which the importance of quality and purity (e.g. free of pesticides, antibiotics, etc...) of the traditional food products was re-established. The latter observation seemed to be linked to an increasing environmental concern and seemed to drive the consumer away from high-tech food, back to traditional protocols and procedures for the cultivation and processing of foods. However, the improved insight in the relation between food and health made the consumer more conscious about the fact that type and variety of food were equally important to quality and purity. The increasing number of civilisation-linked diseases (arteriosclerosis, diabetics, cancer, hypercholesterolemia, ...) and the importance of the medical world in prescribing specific diets for these diseases has stimulated these insights in a large section of the European population. Together with a general increase of the budgets available for food, these tendencies have become the motor behind some of the evolutions discussed today: functional foods, nutraceuticals, novel foods but also the organic concept. From the text below it should be clear that there exists much more than just a chronological similarity between these concepts and that the development towards high-tech functional foods is not so incompatible with the tendency to go back to traditional (and more natural) production processes. Let's focus on the concept of the so-called 'functional' foods first.

### The 'functional food' concept

Although one's perception is that food is becoming increasingly "modern", it is difficult to exactly describe and define the observed 'modifications' and relate recent developments to existing (and accepted) formulas. How do vitamin supplements, widely used since the sixties, differ from the addition of calcium to milk in the nineties? Definitions used to describe these tendencies are likely to be either too restrictive or too broad. Maybe, what we now like to call 'functional foods' and alike, just describes today what was referred to in the past as 'healthy foods'. A short overview.

- An early (successful) definition, is from Japanese origin and relates to the Japanese FOSHU system (Foods for Specified Health Use, 1991): " ...a food which, according to the knowledge about the relationship between foods or food constituents and health, may have positive effects on health and is authorised to display a label stating that people using it for a particular health purpose can expect to obtain a specified result."

The following conditions must be met before a product can be labelled as functional:

- it must be a **food** (not powder, capsule or tablet)
- it can and should be consumed as an integral part of the **daily** diet

- it performs a specific function within the **metabolism** and serves to **regulate biological processes**; the emphasis is placed on tertiary or physiological functions:
  - regulation of biological defence mechanism
  - preventing specific diseases
  - improving convalescence after illness
  - controlling mental and physical conditions
  - slowing down the ageing process
  - regulating the rhythm of physical condition

The value of this extensive definition is clearly that it has allowed, at least in Japan, an officially regulated use and marketing of 'functional food' products. Producers can use the FOSHU label in all their communications after they obtain the FOSHU status for a specific product. The procedure in which FOSHU can be obtained includes the submission of a substantial scientific dossier. Japan is the only country world-wide which installed such an advanced and accepted regulation.

- In 1994, Goldberg (1) launched the following 'functional food' definition "*... any food which, in addition to its nutritional value, has a positive effect on an individual's health, performance and mental state.*"

The major problem being here already that most common foods have specific (positive) interactions with the human body (e.g. because they contain natural concentrations of vitamins, minerals, fibres, etc....).

- Another definition was therefore presented by EAS (European Advisory Services) (2) "*... a food delivering a benefit to health **beyond that of strict nutrition** and making a claim about this benefit*".

This definition stresses the link between the functional food and its effect, which has to be formulated as a claim, raising the next problems:

- What is a claim?
- What about the general principle all over the world that in communications to the consumers, no properties with regard to the prevention, treatment or cure of human diseases must be attributed to foodstuffs.

The persistent link to claims when discussing functional foods has been one of the major obstacles in most discussions and preparation of working definitions.

- One of these first working definitions for the functional food concept prepared for European legislative work was proposed by Prof. M. Roberfroid, the pioneer in this field "*... a food which affects body functions in a targeted way so as to produce positive effects on physiological functions thanks to ingredients that improve health and may, in due course, support claims of health benefits.*" This definition has been the basis of the FUFOS definition (3), used widely nowadays in a European context.

- The FUFOS definition was prepared by ILSI Europe in 1998 (3). In this document the functional food is described solely by its role: "*... a food can be regarded as "functional" if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that it is relevant to either an improved state of health and well being and or reduction of risk of disease*". "A functional food must remain food and must demonstrate its effects in amounts which can normally be expected to be consumed in the diet. They are not pills or capsules but part of a normal food pattern".

A functional food as defined above can be

- a natural food, a food to which a component has been added
- a food from which a component has been removed by technological or biotechnological means
- a food where the nature of one or more components has been modified
- a food in which the bio-availability of one or more components has been modified
- any combination of these possibilities

A functional food as defined above might be functional

- for all members of a population,

- *for particular groups of the population which might be defined, for example, by age or by genetic constitution.*

Again the major problem relates to the fact that many foods, if not all, will affect one or more functions in a positive way. Alcohol free beer, decaffeinated coffee, vitamin C containing orange juice etc.... all fit well to the definition. Therefore, the definition confirms that there is little difference between modern probiotic-, prebiotic-, cholesterol reducing-, etc... functional foods, and the low-fat margarine's of the sixties. This makes the concept of functional food a relatively broad concept. The problem of proper definition, as mentioned above, is heavily linked to the fact that specific 'claims' are made for the products. Actually, the discussion can probably be reduced to the discussions about the type, and scientific validity of the claims made for foodstuffs in general.

### **Some other related definitions**

The concept of 'functional foods' is of course also linked to other evolutions in the food- and food supplement market. A wealth of terminology is available by now. The difference with the functional food definition is not always crystal clear....

Novel foods are " ... *foods or food ingredients, which have not hitherto been used for human consumption to a significant degree within the community and which fall under the following categories.*" (Regulation (EC) No. 258/97 of the European Parliament and of the Council) (4)

- *foods or food ingredients, containing or consisting of genetically modified organisms within the meaning of Directive 90/220/EC*
- *foods or food ingredients produced from, but not containing of genetically modified organisms*
- *foods or food ingredients consisting of or isolated from micro-organisms, fungi or algae*
- *foods or food ingredients consisting of or isolated from plants and food ingredients isolated from animals, except for foods and food ingredients obtained by traditional propagating or breeding practices and having a history of safe food use*
- *foods or food ingredients to which has been applied a production process not currently used, where that process gives rise to significant changes in the composition or structure of the foods or food ingredients which affect their nutritional value, metabolism or level of undesirable substances.*

Parnuts are foods with particular nutritional uses and are defined as " ... *foodstuffs which, owing to their special composition or manufacturing process, are clearly distinguishable from foodstuffs for normal consumption, which are suitable for their claimed nutritional purposes and which are marketed in such a way as to indicate such suitability*" and can also be referred to as 'medical foods' or 'clinical foods'. They are meant to treat an ongoing disease or deficiency by a specific nutrition (e.g. in infants or young children in good health), and are not intended to prevent a disease as might be the case for functional foods. (Council directive May 3, 1989; 89/398/EEC) (5).

Neutraceuticals (or neutraceuticals, or the French 'aliments'), which is composed of the words 'nutrition' and 'pharmaceuticals' (respectively 'alimentation' and 'médicament'), are components which can be considered as food supplements and which can either be added to foods or can be taken separately (e.g. vitamins, minerals, lactoferrin, modified milk proteins). They are most often sold as tablets, pills or powders. Neutraceuticals offer protection against diseases or have a positive influence on one or more body functions. A food product with an added neutraceutical is often referred to as a 'designer food' (Hasler, 1996) (6). The homology between designer foods and functional foods is very high. For some products, e.g. foods containing 'natural plant oestrogens' as a non-medicinal alternative to hormone replacement therapy, the line between medicinal food and functional food becomes blurred. The difference between neutraceuticals and pharmaceuticals, however, is quite clear: the former are taken to **reduce risk** for disease (often compared to wearing a safety belt in the car), the latter to **cure** diseases (see also Table 1).

Table 1 Lists of major differences between different types of food.

<b>Discriminative character</b>	<b>Functional Foods</b>	<b>Nutraceuticals</b>	<b>Medical foods</b>
Purpose	Maintain good health	Improve health	Improve (cure) disease situation
Target population	Total population	Group dependent (age, genetic differences)	Patients
Mode of action	Influence on metabolism	Influence on metabolism	Influencing metabolism related to disease

### **The pool of functional foods**

Examples of functional food components as meant in the FUFUSE definition are many and comprise e.g. poly-unsaturated fat (reduced heart failure risk), vitamin E (protection against oxidation), folic acid (reduces chances of developing colon cancer), iodine (related to thyroid activity), probiotic bacteria or prebiotic fibres (related to improved intestinal flora), or less well known additions like lecithin, sphingolipids, phytosterols, phyto-oestrogens, carotene, green tea-, Gynkgo biloba-, Aloe vera- or olive extracts, lycopene, omega-3 fatty acids, etc... These components can be added to different types of functional foods such as energy- and sports drinks, smart drinks (very common in the US), probiotic drinks, vitamin-, calcium -, fibre-enriched products, enrichments with minerals (iron, selenium), special (short chain) acids, etc... and can be situated in the sector of dairy, bakery, drinks, spreads, etc...

The metabolic/physiological importance of these products prevails and is probably the reason why until now little or no 'organic' versions of functional foods have been put on the market.

The market size of functional foods world-wide is estimated to be \$32 billion (over 1999), 2/3 of which was spent in the US; less than 10% in Europe. A raise to \$54 billion is expected by 2004, or 62% in 5 years (8). Whether this increase can be reached might to some extent depend on the efficiency of the communication to the consumer, explaining the increasing technical complexity of an increasing variety of foods he/she can choose from....

### **The consumer has the right to know**

Nowadays the consumer is no longer directly involved in the production process of food and therefore the whole food chain lacks transparency.

Most of the legislation is trying to protect the consumer and thereby limiting the producer in the type of communication he can make to address the consumer. Still this should not be a problem to the food industry, as long as they accept the fact that the consumer wants to be informed correctly with relevant information. The latter is very important since the use of a scientific language, although correct, but (too) complicated, will only raise further mistrust with the consumer. Furthermore, the information should be honest at all times, since the confidence of consumers will drop dramatically if they find out that the information given was incomplete or wrong....

Experience from the past (GMO containing foods, nuclear power stations, etc...) have shown that the consumer will not accept changes which are not completely clear and need further study. Moreover, this process is not 'a one time decision': many technological evolutions, including in the field of nutrition, are subject of continuous evaluation by the consumer for desirability, efficacy and ethical value.

On the other hand, most consumers will not live (eat) by the book either. They like to neglect general advice on healthy, balanced food, but at the same time expect the food industry to produce foods which taste good, look appealing, are safe under all (their) conditions and are nutritious in all circumstances and at all quantities.... Not an easy task to cope with!

Therefore it is up to the food industry and health authorities to explain to the consumer why e.g. specific fresh foods should be kept a low temperature, why a wide variation of food intake is important to health, why too much alcohol will harm health, or why a lack of fibre can give intestinal problems, etc.... . So the task of the industry towards the consumer is much broader

than simply telling the importance of the products they sell: they should also explain why they are important.... Without doubt: functional foods need communication.

### **The Yakult experience**

Yakult has a very strong tradition in this type of communication. World-wide Yakult has around 27.000 employees who are trained to understand the functionality of the active compound, the strain *Lactobacillus casei* Shirota. Roughly 82.000 so-called 'Yakult ladies' are on the road to distribute the Yakult food products and to **explain through a two-way communication** the background of the products and the importance of a balanced and a healthy way of eating. Within the company's philosophy 'Working on a healthy society' the importance of cultural- and social well-being, is also stressed. Also in Europe there is an active involvement in achieving the ancient saying 'A healthy mind in a healthy body' by promoting cultural and social initiatives and by active participation in forums for discussion, research and communication on the advantageous effects of probiotic food drinks on intestinal flora and health in general.

The lack of contact between consumer and the food production process is also a point that has received considerable attention at Yakult. The factory in Almere, The Netherlands, has an open structure and receives over 10.000 visitors yearly, which offers the possibility to **increase the transparency** of the production processes.

Research on functionality and safety issues has been a red thread through the 65 years of Yakult history. The purpose of **research on probiotics** is to optimise the performance and quality of the products, and understand the mode of action of the functional components. The latter is essential to explain more efficiently to the consumer how health is influenced by the consumption of probiotic foods.

### **The homology with the organic foods message**

The success of organic foods has been linked to several factors (7).

- The success of the food industry to assist in the conversion process of the farmer, by supplying training and information activities and in guaranteeing a comfortable market.
- The availability of public funding for the conversion. This public funding should be approved by the tax payer and therefore will also need honest communication with a balanced presentation of pro's and con's.
- The removal of institutional blockages.

These factors all rely on **good communication** and the tuning of objectives, tasks and final targets (e.g. permitted / prohibited organic claims).

Moreover, it was shown that the acceptance of the consumer of the organic concept is also related to increasing **transparency** and likely to the acceptance of moral issues such as

- environmentally friendly production
- protection of animal welfare
- natural ingredients
- improved taste and quality
- healthy foods, especially for kids
- connection with small-scale farmers and their close link to the product
- the 'feel good' factor confirming correct moral and political values

Stagnation could be due to factors such as

- expensive
- not tasty
- monotonous (vegetarian)
- unsure about the health effects

Communication of all above values together with the actual proof of e.g. improved health and quality will, similarly as for functional food, demand the needs for **proper research and control** activities. Failing to provide these prerequisites may jeopardise the acceptability by the consumer.

Also, due to the scientific support for sustaining a claim like 'organics make a difference to e.g. the metabolism' a consistently higher cost of the product will be inevitable. This links to the initial observation that widespread conversion should not necessarily guarantee profitability in an early stage. Therefore, convincing communication and explanation to the

consumer but also the farmers and retailers will be essential in achieving sufficient growth on longer term.

### **Communication is the magic word ?**

Many food companies have realised the importance of direct communication with the consumer. Also governments have learned from mistakes in the past. In the present European Union 5<sup>th</sup> Framework Research Programme, the scientific evaluation of proposed research projects is followed by a social – economic evaluation which pays attention to how results of research will be communicated, not only to the scientific community, but also to other relevant partners, including the consumer.

The importance of consumer organisations in this communication should not be underestimated. It means that consumer organisations will need to consider consultation of scientific experts for the evaluation of the different aspects involved in the consumer communications (the 'claims'). Often, however, scientists optimally suited to this, have also been involved, directly or indirectly, in the preparation of the final dossier prepared by the producer.... A very interesting ethical situation, which stresses the importance of well structured, independent and sufficiently large-scale control organisations.

In any case, communication will probably not be the only miracle word: good science-based dossiers will be equally important, and the role of scientists with a consistent high credibility cannot be minimised in this scheme.

### **The future of Functional Foods and Nutraceuticals**

Further development of the **functional food** market is probably a certainty, despite the lack, at this stage, of a uniform regulation. The consumer has shown very clear interest in the present developments (expected growth of 62% in 5 years) (8) and will drive the further developments. Major points of evaluation will be **quality** of the product, **safety** and **ethical / environmental** factors. For the latter issue, it is clear that there will be an increasing correlation with the development of the **organics** market. Both evolutions seem to be evolving in parallel.

Related to the quality of the product, the necessity to supply a balanced scientific dossier, understandable at consumer level, will be the first duty of the functional food producer. The continued growth of the organics market, however, also depends on the support by good scientific data.

Four important scientific developments for the food industry will allow better and faster understanding of the functionality of different components offered by the 'natural' biodiversity surrounding us and stimulate the design of products which are in balance with individual requirements for these components (8).

- the increasing knowledge of human genetic properties
- the possibility to select from the natural biodiversity those components with positive cellular and physiological effects
- the development of mathematical models which couple the human genomic data to the functional effects of cellular components
- the possibility to select or modify, by biotechnological means, plants or micro-organisms to contain the desired component in the correct amount.

The latter aspect, 'selection' or 'modification by technology', might remain for a limited number of products the sharpest difference between functional- and organic foods. The consumer, as he/she did in the past, will, without doubt, decide what is most acceptable according to his/her ethical, quality, safety and environmental criteria.

Related to the time frame, the safety aspect of the product, related to the consumption of a large amount consumed both over a long period or short period of time, as well as the control on this should be a permanent point of concern.

### **Conclusion**

The functional food market and the organics market show considerable homologies. These homologies relate to

1. a relatively young market with a very high potential for growth and diversification but with a considerable risk factor because of a continuous evaluation by the consumer
2. the need for good scientific support for the claimed benefits, which are the cause of a more expensive product
3. the maintenance of a continuous image of safety and high quality
4. the necessity of an efficient and honest communication to the consumer
5. the continuous need for innovation and improvement

All of these concerns are to be considered as challenges for the future development of both markets. Therefore there seems little discrepancy between the development of functional foods and the organics market. It is to be expected that when both developments gain further trust from the government, the legislator and the consumer, the benefits offered by both evolutions will gradually merge in the design of an increasing number of organic functional foods.

Another determining factor influencing the acceptability of the increased technological character of food products relates to the degree of willingness of the consumer to

1. learn and understand about the scientific reasons behind the technology
2. reveal, to some extent, the individual genetic identity in order to prepare a personal optimal nutrition
3. pay considerably more for food

and the efficiency by which the legislator can control the effectivity and safety of the products.

An important factor related to the acceptance and growth of the organics market, relates to the efficiency of control on the "organics" level in the complete chain, starting from the fertiliser used for the grass, the animal medicines needed from time to time, or the necessary 'natural' preservatives to keep fresh products to a quality requested by the consumer. The consumer also needs to be educated to treat his food, once taken home, in a correct way in order to continue the complete chain of care, warranted by good quality foods.

A proper regulation, control and communication, based on reliable science for organic- as well as functional foods can thus help to rebuild consumers and producers confidence in a safe, healthy, and ethical food chain.

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