NEW HORIZONS IN FUNCTIONAL FOOD SECTOR: AN INDIAN PERSPECTIVE

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ABSTRACT

Functional foods have been the topic of considerable interest in the food and nutrition industry for years. India’s nutrition industry is generating US$6.8 billion in annual revenue, and that number is expected to nearly double in the next five years. New evidence concerning the potential benefits and challenges associated with functional foods is constantly emerging in both the scientific literature and the popular media. The backward and forward linkages potentially create opportunities for employment and additional income for the population from production and supply chain activities and may increase demands for private laboratory services, training, and market. Key concerns that may require public support include: underdeveloped infrastructure, lack of resources for research and gap between academic research and the industry and the high costs in meeting food safety regulations. In this article, current functional food trend from an Indian perspective and its potential contribution to international markets is briefly discussed.

Key words: Functional foods, India, Regulations, Market, Health benefits.

INTRODUCTION

With change in economic status, life style, increased life expectancy and greater media coverage of health care issues, consumers are more interested in the potential benefits of nutritional support for disease control or prevention. At the same time, advances in food/ingredient technologies, coupled with a better understanding of specific nutrient properties have stimulated an explosion of innovative nutritive products by food manufacturers (Hardy, 2000). There is growing recognition of the potential role for functional foods in helping to reduce health risks and improve health quality. Foods that may have health benefits beyond the traditional nutrients that they contain are often called “functional foods”. In the global market, functional foods have become a multi-billion dollar industry (Saikat et al., 2007), being the fastest growing segment of today’s food industry. The concept of functional foods has become popular, first in Japan and later in other countries, including U.S (Hasler, 2000). As a working definition, a food can be said to be functional if it contains a component (whether or not a nutrient) that benefits one or a limited number of functions in the body in a targeted way that is relevant to either the state of well-being and health or the reduction of the risk of a disease (Bellisle et al., 1998), or if it has Physiological or psychological effect beyond the traditional nutritional effect (Clydesdale, 1997). A functional food component can be a macronutrient if it has specific physiological effects (e.g. Omega-3 fatty acids) or an essential micronutrient if its intake is more than the daily recommendations. Indeed, beyond its nutritional (metabolic requirements) value and function of providing pleasure, a diet provide
consumers with components able to both modulate body functions and reduce the risk of some diseases (Roberfroid, 2000). Selected examples of functional foods, their functional components and health benefits are presented in Table 1. Moreover, demand for functional foods is growing within the developing countries like India, presenting an opportunity to develop domestic markets. The economic returns from functional foods can offer improved opportunities for all members in the supply chain: from raw material producers and processors to retailers. The economic growth has led the developing countries to emerge as exporters to cater to the increasing demand in the developed countries (Melissa et al., 2006).

In this paper, we examine current functional food trend from an Indian perspective to identify the potential for distinctive niche markets and growth of the industry in India as well as its potential contribution to international markets.

**Market description:** India’s population is large and predominantly young; as the younger generation moves toward middle age and income increases, the need to maintain and/or establish a healthy diet will drive functional food consumption increasingly higher (Kotilainen et al., 2006). With its strong tradition of healthy eating, India ranks among the top ten nations in buying functional foods (Watson, 2006). India’s nutrition industry is generating US$6.8 billion in annual revenue, and that number is expected to nearly double in the next five years (Ismail, 2006). The functional food industry in India is strong and growing with aims of becoming a major force in the international health foods market (Japan Development Institute, 2006). India has a large share of the international functional food market, and exports products to the far-east, south-east, west and middle east Asia as well as to parts of North Africa and the EU. However, India’s major export destination is the USA and Japan (Patwardhan et al., 2005). The government is working hard and fast at shoring up its intellectual property rights, laws and food legislations with regard to functional foods. The productivity in this sector is growing and investment in research and development infrastructure continues to increase year-over-year (Ismail, 2006). This ambitious state of affairs is due to cooperation at all levels. Unanimity of purpose exists between major companies and in the government, where both ministers and the substantial state research organization are behind the idea (Shrimpton, 2004). In addition, the functional food market has met with popular acceptance from consumers at large. Nine out of ten urban Indian consumers have been reported to generally choose foods based on health and wellness benefits (Ciocca, 2003). The government is active in the development of the functional foods industry. According to Ministry of Food Processing Industries representative, the Ministry has mandated to develop and promote the food processing sector including functional foods, throughout the country. It conducts seminars, workshops and training programs; and runs a financing scheme, providing grants-in-aid to the food processing companies that want their manufacturing/processing units certified to meet safety standards such as HACCP and ISO (Japan Development Institute, 2006). In addition to the substantial government support, the functional foods industry is thriving in the private sector. According to one of the study, consumer goods giants in India understand their consumer targets well and are successfully positioned in both mass-market and higher value-products (Japan Development Institute, 2006). In India, many suffer from deficiencies of iron, iodine and Vitamin A. To deal with these deficiency conditions, fortified foods viz. wheat flour, iodized salt, calcium, vitamin-enriched jams and soft drinks are included as the part of daily diet of the urban population. National Iodine Deficiency Disorders Control Programme (NIDDCP) formerly known as National Goitre Control Programme (NGCP) is being implemented from 1962 (NHRM, 2008). The Central Council of Health and Family Welfare in 1984 decided to implement compulsory iodisation of Salt for human consumption in the
entire country. The Programme started in a phased manner with effect from 1st April, 1986. For the high value market, companies have launched products such as low-sodium salt, catering to blood pressure patients (Nutraingredients.com).

Production and popularity of functional foods: A food product can be made functional by eliminating a component known to cause adverse effect when consumed viz. allergy inducing proteins, increasing the concentration of a component naturally present in food to produce beneficial effect e.g. by fortification with a micronutrient to reach a daily intake higher than the recommended daily intake but compatible with the dietary guidelines for reducing risk of disease, adding a component that is not normally present in most foods and is not necessarily a macronutrient or a micronutrient but for which beneficial effects have been shown (e.g. non-vitamin antioxidant or prebiotic fructans), replacing a component, usually a macronutrient (e.g., fats), whose intake is usually excessive and thus a cause of deleterious effects, by a component for which beneficial effects have been shown [eg, chicory inulin such as Rafticream (ORAFITI, Belgium)]. Increasing bioavailability or stability of a component known to produce a functional effect or to reduce the disease-risk potential of the food (Block, 1993 and Franck-Frippiat, 1992 ). Table 2

<table>
<thead>
<tr>
<th>Type of functional food</th>
<th>Functional component</th>
<th>Benefit to health and well being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole oat products</td>
<td>Beta - glucan</td>
<td>Lower cholesterol levels</td>
</tr>
<tr>
<td>Psyllium</td>
<td>Soluble fiber</td>
<td>Lower cholesterol levels</td>
</tr>
<tr>
<td>Whole soy foods and foods made with soy protein</td>
<td>Soy protein</td>
<td>Lower cholesterol levels</td>
</tr>
<tr>
<td>Special fortified margarines or salad dressings</td>
<td>Plant stanol or sterol esters</td>
<td>Lower cholesterol levels</td>
</tr>
<tr>
<td>Sugarless chewing gums and candies</td>
<td>xylitol</td>
<td>Helps prevent dental caries</td>
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<tr>
<td>Fatty fish</td>
<td>Omega-3 fatty acids</td>
<td>Reduced risk of heart disease</td>
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<tr>
<td>Cranberry juice</td>
<td>Proanthocyanidins</td>
<td>Reduced urinary tract infections</td>
</tr>
<tr>
<td>Garlic</td>
<td>Organo sulphur compounds</td>
<td>Lower cholesterol levels</td>
</tr>
<tr>
<td>Green tea</td>
<td>Catechins</td>
<td>Reduced risk of some types of cancer</td>
</tr>
<tr>
<td>Tomatoes and tomato products</td>
<td>Lycopene</td>
<td>Reduced risk of some types of cancer, especially prostate cancer</td>
</tr>
<tr>
<td>Dark green leafy vegetables</td>
<td>Lutein</td>
<td>Reduced risk of age related macular degeneration</td>
</tr>
<tr>
<td>Meats and dairy products</td>
<td>Conjugated linoleic acid</td>
<td>Reduced risk of breast cancer, increased muscle mass</td>
</tr>
<tr>
<td>Eggs</td>
<td>Omega-3 content</td>
<td>Reduced risk of heart disease</td>
</tr>
<tr>
<td>Cruciferous vegetables</td>
<td>Isothiocyanates, indoles</td>
<td>Reduced risk of some types of cancer</td>
</tr>
<tr>
<td>Fermented dairy</td>
<td>Probiotics</td>
<td>Support gastrointestinal tract health, boost immunity</td>
</tr>
</tbody>
</table>

Source: Hasler 2000 Ashwell 2002; Fogliano et al 2005; Roberfroid 2000;
presents the bioactives for various health promoting functions.

Various factors related to the popularity of functional foods have been reported (Belem, 1999; Breithaupt, 2004; Childs, 1999; De Felice, 1999; DellaPenna, 1999; Drouin and Gosselin, 2002; Elliott & Ong, 2002; Hardy et al., 2003; Hasler, 2000; McNamara, 1997; Peterson & Dwyer, 1998). Some of the important factors are:

**Health consciousness among consumers:**
With education and media, health awareness is driving more consumers to take a more proactive role in managing their health. People are less willing to simply wait and implement health care advice provided by a medical community in response to health problems.

**Socio economic trends:** With the advent of urbanisation and globalisation, rise of double income families, and tremendous stress in today’s world, women have less time to spend in kitchen. Thus, family is deprived of fresh and nutritious diet. In order to combat nutritional deficiencies, more and more nuclear families are driven towards convenient and nutritious foods. This has led to the emergence of functional food sector in India. Moreover, as people are living longer (ageing population), with lengthened years, comes increased threat of chronic diseases and from a socio economical viewpoint, countries are facing financial difficulties in escalating medical care costs due to the increase in chronic diseases and the expansion of life spans. Thus, it provides a cost effective alternative rather than to invest in medicine. Thus, government is aware of the economic potential of these products as part of public health prevention strategies. Moreover, a vast majority of people has a positive image of healthy food and agrees that food and nutrition have a positive impact on long-term and current health (Landstrom et al. 2007). The observed growth in this market is driven largely by consumers aim for a healthier lifestyle through a dietary approach.

**Research and Development:** Innovative methods in the areas of food technology, food biochemistry and the nutritional sciences (including nutritional genomics) are providing consumers with access to fresh and often supplemented produce with recognizable health benefits. Thus, it provides new options for use of functional food products.

**Government regulations:** Changes in government policies and laws regarding nutritional

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**Table 2:** Bioactive components and their health promoting functions.

<table>
<thead>
<tr>
<th>Bioactive components</th>
<th>Health promoting functions</th>
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<tbody>
<tr>
<td>Oligosaccharides, Lactobacillus, Bifidobacterium, Psyllium husk, indigestible dextrin, wheat bran, low molecular sodium alginate, partially hydrolyzed guar gum</td>
<td>Foods for gastrointestinal health</td>
</tr>
<tr>
<td>Soy protein, chitosan, low molecular sodium alginate, peptides, diacylclycerol, plant sterol/stanol (esters), green tea catechin, middle chain fatty acid, Drug and Health Administration, Environmental Protection Agency, degradation products of globin protein, Psyllium husk</td>
<td>Foods for people with high cholesterol/triglyceride level and body fat</td>
</tr>
<tr>
<td>Indigestible dextrin, L-arabinose, wheat albumin</td>
<td>Foods for those with high blood glucose</td>
</tr>
<tr>
<td>Xylitol, polyols, tea polyphenols</td>
<td>Foods for dental health</td>
</tr>
<tr>
<td>Soy isoflavone</td>
<td>Foods for bone health</td>
</tr>
<tr>
<td>Heme iron</td>
<td>Foods for those prone to anemia</td>
</tr>
</tbody>
</table>

labelling, distribution and marketing of food lead to the increased health and clinical benefits associated with high quality and nutritional foods.

Expansion of the Global Marketplace: Better communications and transport for goods is resulting in a more accessible global marketplace and an increase in international business opportunities. This results in a more business-friendly environment for expansion of industry.

Opportunity and constrains in the sector:
With prevalent poverty, high rates of malnutrition and escalating rates of diet-related diseases in developing countries, growing functional foods markets provide opportunities for developing countries in public health, for generating employment and income in the development of functional foods and their supply chains (Niba, 2003). In addition to the health benefits, functional foods present new economic opportunities. Functional foods sell at higher prices and contain larger profit margins than conventional foods, which make the sector attractive for the players in the supply chain. The growth of the functional foods sector not only represents significant benefits to the health sector but also offers opportunities for processing and manufacturing companies. Manufacturers and their search for added-value, higher margin products provided key impetus for the growth of functional products. However, the potential for financial gain resulted in many unsupported claims for functional ingredients by commercial enterprises whose interests lie more in profit rather than sound science (Jones and Jew, 2007). As a result, the field of functional foods has been tarnished and suffers a credibility gap.

Functional foods sector can play a major role in economic growth for many developing countries endowed with rich biodiversity and traditional knowledge of the health effects of certain indigenous plant species. Besides the opportunity for diversified and high-value production, farming for the functional foods industry can benefit primary producers and rural communities in other ways. Poorer communities can benefit from growing functional food markets through domestication of wild plant species; enhanced links to the private sector, for example, through contract farming; employment or business opportunities from processing functional foods (Melissa et al., 2006).

Despite the rich source of raw materials for functional food products because of their vast biodiversity and cost advantages in crop production, market for functional foods in India has various constrains. One of the significant barriers in developing functional food industry is the low income of vast majority of the population. The cost of bringing a new product to the market can be significant, especially the upfront costs associated with high-value food processing, search for markets, product research and certification, meeting regulatory demands, consumer research, public relations and exporting. The development and marketing of functional foods require significant scientific support for claims as a functional product. This involves identifying functional compounds, assessing their physiological effect, taking into account bioavailability in humans and potential changes and during processing and food preparation and clinical trials on product efficacy in order to gain approval for health-enhancing marketing claims. This research requires time, financing, and skilled labour, especially for products destined for export markets. Most countries lack a suitable regulatory category for functional food products, which makes market development much more complicated. A clear regulatory system for production, sales, certification, and advertising of functional foods, together with consistent enforcement are critical factors in building consumer trust in functional foods (Japan Development Institute, 2006). Other constrains include: lack of physical infrastructure, unorganized and fragmented retail network; lack of resources for research and little cooperation between academic research and the industry, emphasis on low-level processing of bulk commodities, the high cost of ingredients and
the high costs in meeting food safety and quality regulations.

**Regulation and labelling of functional foods:**
In India, voluntary standards are developed by the Bureau of Indian Standards, the National Standard Agency that comprises representatives from various food sector stakeholder groups. In addition to developing National Standards, the Bureau is involved in product testing and certification. A network of testing organizations conducts conformity testing against relevant standards. Efforts are made to match Indian standards with international ones (U.S. Commercial Service, 2006). The Prevention of Food Adulteration (PFA) Act has specific definitions for every food preparation sold in the country and as such, it does not provide flexibility to the food manufacturers to produce new recipes without violating the law. In cases, where scientific evidence requires amending the standards, the producers can appeal to have the PFA Rules amended. Under the PFA, the Central Committee for Food Standards, chaired by the Director General of Health Services, is responsible for the final decision regarding PFA rules. Since many of these recipes are classified as proprietary foods, manufacturers are reluctant to share data with the authorities, fearing this data might be shared with competitors (Japan Development Institute, 2006).

**CONCLUSION**
Functional food industry in India is small but growing and has an opportunity to develop local markets to supply this demand. The Indian biodiversity holds potential for new functional foods and/or ingredients. Key concerns that require support include: the cost of bringing a new product to the market, search for markets, product research and certification, meeting regulatory demands, consumer research and public relations. Survival in this industry requires cutting-edge R&D and high technical expertise. Partnerships amongst functional food manufacturers, nutrition companies and food additives companies is the right strategy for the formulation of a product that is healthy, offers great flavours and is palatable along with being affordable. Although functional foods have significant promise in the promotion of human health and disease prevention, health professionals, nutritionists and regulatory toxicologists should strategically work together to plan appropriate regulations to provide the ultimate health and therapeutic benefits to mankind.

The Central Food Technological Research Institute in Mysore has extensive research facilities and activity in this sector. Elsewhere, food laboratory capacity is currently insufficient for the industry needs especially considering the need to adhere to international standards. The future of functional food markets will depend on how these concerns will be addressed by government and how international organizations and the private sector can participate and facilitate this process.

**REFERENCES**


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