

Available online at www.fooddynamics.org

INTERNATIONAL
JOURNAL ON
FOOD SYSTEM
DYNAMICS

Int. J. Food System Dynamics 2(2), 2011, 126-144

Consumer Market for Functional Foods in South Brazil

Marcia Dutra de Barcellos and Rafael Laitano Lionello

Federal University of Rio Grande do Sul, Postgraduate Program in Business Administration (PPGA/EA/UFRGS), Brazil
mdbarcellos@ea.ufrgs.br, rafaelaitano@hotmail.com

Received March 2011, accepted September 2011, available online December 2011

ABSTRACT

This study aims at investigating the consumer market for functional foods (FF) in Porto Alegre, South Brazil. Functional food is any healthy food claimed to have a health-promoting or disease-preventing property beyond the basic function of supplying nutrients. Health has been named as the most significant trend and innovation driver in the global food and drinks market. Brazil is one of the leading countries in food production and consumption, and the market for functional foods have been growing 10% per year, three times more than the market for conventional foods. Although this food category is considered mature in some developed markets (such as in Japan, in the Nordic countries and in the U.S), it is still unknown for many consumers, especially those located in developing countries. On the other hand, functional foods has been attracting the attention of multinationals and local food industries in Brazil, since innovation can significantly impact on their competitive advantages. Therefore, in this study, first we are going to identify the availability of functional food products in the local retail market, through observation techniques. Our aim is to confront consumers' needs with local food companies' market supply. Secondly, we investigate consumers' motivations, attitudes and intention to buy functional foods, since the market demands a better understanding of this trend. A survey with 450 consumers was conducted and provided quantitative insights. Results indicate that the market for functional foods in Rio Grande do Sul is incipient, but it is developing fast. There are few local functional food products in the market, but those are attractive to consumers and indicate promising opportunities. The survey shows that interviewed consumers presented positive attitudes towards functional foods and enough purchasing power to buy it. Dieticians, nutritionists and other health professionals have high credibility and could help inform consumers about the benefits of particular categories of functional foods. Food industry itself is not regarded as the most trustworthy source, what indicates the need of more attention to this fact from a corporate point of view. Finally, this study shows that the understanding of Brazilian consumers is fundamental to help food companies define their strategies. To map the most accepted categories of functional foods is also important, aiming to avoid the "tentative and error" approach.

Keywords: functional foods, consumer market, attitudes

1 Introduction

In recent years, the quest for increased competitive advantage has driven many organizations to innovate (Coutinho and Ferraz, 1995; Castilhos and Passos, 1998). The economic growth, traditionally attached to supply and demand, is now a synonymous of imbalance and detachment a company can obtain in its own industry, if compared to the others (Schumpeter, 1982).

Technology, up to this point incidental, became a crucial tool in the strategic management and market positioning. Innovation also became increasingly dynamic due to the short lifecycle of products (Castilhos and Passos, 1998; Cooke, Uranga and Etxebarria, 1997). By definition, innovation is the implementation of new (or significantly improved) product (or service), process or organizational method (OECD, 1997). This, however, is not obtained by a company on an isolated perspective, but by the interrelation of that company with several other factors and agents, contributing to diverse functions in the development or

diffusion of innovations (Nelson, 1993; Freeman, 1995; OECD, 1997).

Particularly in the food industry, innovation is an important source of differentiation and a value-adding opportunity for managers to develop new products. Hence, innovation constitutes a competitive advantage in the globalised agri-food scenario (De Barcellos et al., 2009).

Health has been named as the most significant trend and innovation driver in the global food and drinks market. Brazil is one of the leading countries in food production and consumption, and the market for functional foods have been growing 10% per year, three times more than the market for conventional foods (Euromonitor, 2010). Functional foods therefore represent an important segment for innovation, since these foods are not intended only to satisfy hunger and provide humans with necessary nutrients, but also to prevent nutrition-related diseases and increase physical and mental well-being of consumers (Menrad, 2003).

For instance, PepsiCo, the food and beverage giant, is planning to focus on innovation, emerging markets and enhancing its nutrition business as a means of driving growth. Such ambitions include tripling its annual nutrition revenues from \$10 (€7.1bn; £6.2bn) to \$30bn by 2020, to which end PepsiCo has established a new nutrition centre, to be based at the organisation's Chicago office (Warc, 2011).

In spite of such expressive growth and increasing interest by multinationals and retail chains, this food category in specific is still unknown for many consumers, especially those located in developing countries. We thus outline in this paper consumers' motivations, attitudes and intention to buy functional foods in South Brazil, since the market demands a better understanding of this trend. Secondly, we identify the availability of functional food products in the local retail market, through observation techniques. Our aim is to confront consumers' needs with local food companies' market supply.

This paper is structured in the following way: first, we present a brief description about the functional food concept. Consumer behaviour in South Brazil and their attitudes towards functional foods are then discussed, in the light of theory. Finally, a methodological section is presented, followed by results, discussion and main conclusion of this study.

2 Functional Foods

In last century, advanced research in nutrition led to the discovery of nutrients and their requirements for the development, growth and maintenance of the body. The concept of a "balanced diet" has been the main driving force in support of the elaboration of dietary recommendations and food guidance. But, at the turn of the 21st century, new challenges arise in nutrition science. The definition of health is no longer restricted to the absence of disease, but it includes physical as well as mental and psychological well-being. Food is not only required for body development, growth and maintenance but it is also recognised to play a key role in the quality of life (Ashwell, 2002).

"Food feeds more than the body; it also feeds our moods, our self-image, and our relationships. Since humans moved from being 'hunters and gatherers' to social animals, food has played a significant part in human relationships and has a complex stream of social meanings around it. It is often used as a transactional gift in relationships which carry emotional benefits of major significance" (IPA, 1994)

The term "Functional Foods" (FF) was first introduced in Japan in the mid-1980s and refers to processed foods containing ingredients that aid specific body functions, in addition to being nutritious. Currently, there is no universally accepted term for functional foods. A variety of terms have appeared world-wide such as nutraceuticals, medifoods, vitafoods and the more traditional dietary supplements and fortified foods. However, the term functional food has become the predominant one even though several organizations have attempted to differentiate this emerging food category (FAO, 2007).

Therefore, the term "functional food" refers to a food that provides a health benefit as well as nutrients. The term can also refer to whole foods, to fortified, enriched or enhanced foods, and dietary supplements that have the potential to improve mental and physical well-being and reduce the risk of diseases. The ingredients responsible for this benefit can be naturally present or may have been added during processing. The levels of nutrients in foods can be increased beyond their natural levels to create an enriched product. Fortified products contain nutrients or ingredients that were not present in the original food. The concept was further developed in the United States and in Europe, although nowadays there is a global (and growing) market for 'functional foods'.

Functional food is a dynamic market, which offers excellent prospects for growth for well-positioned food and drink manufacturers. Value sales had risen by 40% over the 2003-2008 period. The rise of functional foods occurred at the convergence of several critical factors (Euromonitor, 2004), such as:

- Awareness of deterioration in personal health, led by busy lifestyles with poor choices of convenience foods and insufficient exercise.
- Increased level of information from health authorities and the media on nutrition and the link between diet and health, which created a more educated consumer.
- Scientific developments in nutrition research, leading to a number of discoveries of ingredients with health properties which could be incorporated into foods.
- Increased incidence of self-medication, led by government reduction on healthcare expenditures, leading to increased sense of personal responsibility for healthcare.
- A crowded and competitive food market, characterised by pressured margins, creating a financial imperative for food manufacturers to seek out methods of differentiating their products and boosting flagging margins.

According to data published by FAO (2007), the functional markets grow steadily each year, with annual growth rate estimates varying between 8% and 14%. This trend is likely to continue as changing population demographics (e.g. an ageing population) and the effects of lifestyle diseases create greater demand for food products targeting health and wellness.

Williams et al., (2006) indicate that demand for functional foods within the developing countries is growing, presenting a lucrative opportunity to develop domestic markets. For instance, India, with its strong tradition of eating healthy foods, ranks among the top ten nations in buying functional foods and the market size is expected to nearly double in the next five years. In Brazil, the sector is relatively young, but grows rapidly with sales value estimated to reach US\$1.9 billion by 2009. In China, the total functional foods market is approximately US\$6 billion per year, which is expected to double by 2010.

2.1 The Dynamics of the Innovation System for the Functional Food Market

The functional food market is still in an experimental phase. It is characterised by a very high level of product failures, even from experienced and well-established food companies, such as Nestlé (LC1) (Just Food, 2008).

Typically, the more successful products tend to have a fairly mainstream positioning. They are marketed through mass-market distribution outlets (such as supermarkets, rather than health food shops), are produced by a well-known food company or as a brand extension of a well-known brand, and they are positioned as generally contributing to wellness, rather than targeting a specific illness. Products which have fared less well tend to have taken the opposite positioning, which has left them restricted to a niche market positioning. Overly clinical products, which appear closer to medicines than to food, tend to deter consumers. This includes foods launched by pharmaceutical companies, those focused on alleviating a particular complaint and those that use doctor recommendations and overly scientific explanations of their benefits. Although these may offer more cutting-edge benefits, they are not well understood by the consumer, and are not perceived as “food” in the same sense (Euromonitor, 2004). Successful products do not promote their health benefits in a vacuum – they also pay close attention to other selling points, such as taste, convenience and price. For a functional food to perform well, it should be competitive even without the health benefit factor (Verbeke, 2006).

The rise in health awareness, which gave birth to functional food, also stimulated interest in other types of food, which act in competition to functional products. Most notable of these is the category of naturally healthy foods, such as wholegrain, oats, soy, cranberries and green teas, among others. These products can also leverage the health benefits of their nutrients as a selling point, and they are therefore positioned very close to functional foods and offer considerable threat. Functional foods are also under pressure from “better for you” foods, such as those with reduced fat or sugar content, and from organic foods. Indeed, controversy over the food chain following a number of food scares has catalysed increased demand for “pure” organic foods and could potentially damage sales of functional foods, which in some cases are viewed as “adulterated”. This view is exacerbated by bad publicity regarding genetically-modified (GM) foods, which are sometimes confused even with the more basic functional foods (Blendon et al., 2007; Euromonitor, 2004).

Consumers tend to reject too much novelty in food, thus constituting strong barriers to genuine innovation (De Barcellos et al., 2010; Van Wezemael et al., 2010). Besides also present a slow rate of change on eating preferences and habits. Nonetheless, innovative consumers represent a key market segment. They play an essential role in the success of a new product by legitimizing the novel product to other consumers (Huotilainen, Pirttilä-bäckman and Tuorila, 2006).

Hence, innovation in the food sector is still a challenge. Costa and Jongen (2006) state that the European food and beverage industry is quite conservative in the type of innovations it introduces to the market, displaying much lower research and development (R&D) investments than industries in other sectors. Some possible explanation, according to studies by Cooper (1994) and Costa and Jongen (2006), is that many food product introductions fail. Research across six European countries shows that only a fifth of new launches are successful (defined as achieving monthly sales of 80 per cent of the average for the category in question). These launches include completely fresh brands, line and flavour extensions and new pack sizes (Benady, 2008).

As a consequence of such negative product introduction results, the food sector strategy is characterised by a parsimonious development of innovations. Much of the innovation is based on brand extensions of the same product line which is a less risky strategy (Grime, Diamantopoulus and Smith, 2002). Previous study in Brazil identified that food industry could be missing an opportunity by not being innovative enough. The innovative products launched by the drinks and beverage sector seemed to be leading consumers' experiences, therefore pointing to the food industry that more could be developed (De Barcellos et al., 2009).

Hobbs (2001) highlights that supply chains for functional foods evolve in an environment of uncertainty. In large part, this is because the products are based on new and evolving technologies, selling into new and evolving markets. While this presents an opportunity to target new "niche" markets, it brings with it added challenges. A summarizing figure is presented to capture some of the strategic choices this kind of industry might follow (Fig.1). One of the underlying assumptions proposed by Mark-Hebert (2004) is that the food industry is facing a challenge of changing attitude towards food production. In this perspective a faster moving market requires a strategy that combines "market pull" and "technology push" as driving forces for the innovation process.

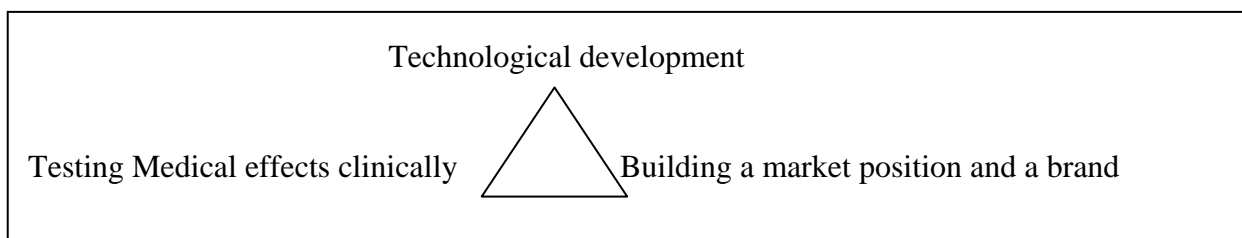


Figure. 1. Three corner stones for creating added value in developing functional foods; technological development, testing medical effects clinically and building a market position
Source: Mark-Hebert, 2004

According to Mark-Hebert (2004), businesses that want to succeed in this market will have to find new ways of conducting management and in identifying critical technologies. Companies will have to build internal skills, employ innovative external sourcing, develop new markets, establish alliances, develop packaging, build strong brands and find venture capital for new developments. As the author state, "these strategic options are quite uncharacteristic for the traditional food industry". It has characteristics of a changing market where flexible strategies are reflected in strategic collaborative development that is ahead of the development of legal frameworks, on the market as well as in individual companies.

Recently, new organizational forms such as clusters have been established in the food sector to promote innovation and enhance industry competitiveness (see for instance, the Foodcluster Holland or the French Food Cluster F²Cinnovation). In South Brazil, this idea is still embryonic, but developing (see for instance, the launch of a technological pole focused on functional food by a local University called Nutritech). Rosenfeld (1997:10) defined industry cluster as "a geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialogue, that share specialized infrastructure, labor markets and services, and that are faced with common opportunities and threats". The proximity among firms eases the coming into contact of firms and the sharing of resources, knowledge and capabilities. Clusters therefore promote innovation through technology and knowledge transfer, development of a skilled labour force in related industries, and the social infrastructure (Ferreira and Serra, 2008), but successful clusters are certainly dependent on an effective innovation system to flourish.

In the next section, we discuss consumer behaviour towards functional foods in theory, moving afterwards to our research method, findings and final remarks sections.

2.2 The functional food consumer

The functional food market can be characterised as “technology-push”, which is predominately oriented by the research of new opportunities for innovative products by companies and, in a smaller proportion, by consumers’ demand. For Scholderer and Barcellos (2008), a great part of P&D activities is still accomplished in an experimental concept, following the logic of attempt and error, with a very small effective use of applied research in consumer’s behaviour. Consequently, there is a high failure rate in the release of new products, even those coming from expert and well-established companies, such as Nestle (LC1) (Raud, 2008).

In general, the key factors influencing the intention to consume functional foods (Urala and Lahteenmaki, 2007) are flavor, quality, price/value, convenience and expected health effects. Therefore, functional foods must attend consumers’ desires for convenience, health and flavour, simultaneously (Gray et al., 2003).

However, it is relevant to observe that functional foods, for having so many categories, are not perceived as a homogeneous group by consumers (Urala and Lahteenmaki, 2003). Also, the attitudes and lifestyle - other than demographic factors as gender, age or education - deeply affect the acceptance and consumption intention of functional food (Urala and Lahteenmaki, 2007) and, therefore consists in important elements on consumer’s segmentation.

One of the consistent results from researches (Bech-Larsen and Scholderer, 2007; Frewer, Scholderer and Lambert, 2003) is that consumer’s orientation related to health varies, systematically, according to gender and age. Generally, women tend to be slightly oriented to health than men, as middle-aged and elderly consumers are inclined to be substantially more oriented to health than younger ones.

According to Frewer et al. (2003), the main reason for women being more conscious about health appears to be related to their sense of responsibility to the family welfare (also directed linked to women as the dominant role on family food acquisition). For middle-aged and elderly consumers, that occurs only because these individuals have a higher probability of being diagnosed with some disease than those who are younger.

A second discovery from researches, in consumer’s behaviour area (Verbeke, 2005; Frewer et al., 2003), indicates that functional ingredients successfully established and with a more general health claim are more likely to be accepted than non-familiar ones or those just attractive to consumers with advanced medical and nutritional knowledge. Therefore, it becomes easier to obtain the acceptance from consumers of functional foods enriched with bioactive compounds already known from its benefits to health (for example calcium, vitamin C or Omega-3) than compounds unknown for the general public (as peptides, Selenium and Xylitol).

In third place, consumers don’t always accept the ‘combination’ between the ‘carrier’ food (the base-food, as yogurt in the probiotic case) and the functional ingredient (Siegrist et al., 2008). The main reason behind it is the fact that consumers create an disadvantageous expectation related to taste when there is an incompatibility between the carrier and the functional ingredient (for example, when a fruit yogurt is enriched with Omega-3, it creates the immediate association to the extraction of the ingredient from fish oil and it could, consequently, changes negatively the yogurt flavour).

In addition, it is believed, generally, that consumers evaluate functional foods the same way they do conventional food. It means that functional benefits can add value, but should not exceed the natural sensorial properties of food, as flavour (Verbeke, 2006).

2.3 Attitudes toward functional food

Attitudes have many functions referred to human behaviour: they orient perception and influence directly consumer’s behaviour (Ajzen and Fishbein, 1980; Ajzen, 1991). One attitude can be defined as “one psychological trend that express itself when individuals evaluate specific products or objects and manifest determined degrees of acceptance or rejection (Eagly and Chaiken, 1993). Thus, as attitudes influence deeply the choice behaviour, they can be used to explain the different choices that consumers do (Tuorila and Cardello, 2002).

For Eagly and Chaiken (1993), attitudes become more stable when the object becomes familiar (in this case, functional foods). However, attitudes can change rapidly, thanks to the fast alterations in product availability and also due to the dimensions and safety that are related to the aspects of innovation of functional foods. Thus, the attitudes related to health and innovation and the interest in natural products become fundamental to predict choices of functional foods (Bäckström et al., 2003).

The attitudes related to functional foods have been internationally studied and consistent research results have been described on literature (Urala and Lahteenmaki, 2003, 2004, 2007). In 2007, Urala and L  hteenm  ki validated a scale formed by 25 variables and four main dimensions were identified. According to the authors, the dimensions can be described as follows:

- Reward for the consumption of functional food (FF REW): The main focus is that health, humor and welfare can be promoted by the consumption of functional foods. The pleasure resulted from the idea of consuming functional food to take care of themselves is crucial to consumers' sensation of 'reward';
- Necessity of functional food (FF NEC): Describes the necessity for functional foods as the necessity for medicines. This dimension measures how necessary or unnecessary are the functional foods to society in general;
- Confidence in functional food (FF CON): Describes the confidence of consumers on functional foods as foods which promotes health and the reliability of researches related to them and;
- Safety of functional food (FF SAF): This dimension (Urala and L  hteenm  ki, 2004) focus the possible nutritional risks when functional foods are consumed.

Through the comprehension of consumers' attitudes, it is possible to predict the intention about the consumption of functional food (Urala and L  hteenm  ki, 2007). Consumers' attitudes can also be strategically used on the initial states of the new products development, as a support tool in the selection of alternatives for further progress.

3 Method

3.1 Characterisation of the study

In its initial stage, this study is characterised as exploratory in nature, which aims to "provide a framework that can facilitate the process of deduction of relevant issues in the investigation of a phenomenon" (Tripodi, Fellin and Meyer, 1981). This type of study is justified on the basis of character description and exploration of a phenomenon, in this case, the characterization of the consumer market for functional foods, issue that is not sufficiently known in Brazil, an emerging country from South America.

At first, we used secondary data from the literature to characterise factors influencing food consumption in Brazil, since attitudes towards production and manufacturing functional foods are highly related to the market profile, as well as on consumer habits and their peculiarities. Data from different sources were obtained (such as academic papers, national statistics from the Brazilian Institute for Geography and Statistics and international market reports - agri-food trade services, Euromonitor, Datamonitor, Warc, others) and are presented at section 4.1.

At section 4.2 we present a characterisation of the supply of functional products in Porto Alegre based on direct observation of available functional food products at local retail level. Using a spread sheet-site observation we identified the type of functional food product, its category, the main benefit offer to consumer, the brand and status of the food processing industry (if national or multinational). Three retail stores were visited and the products commonly found at these visits are described here.

In the next stage, descriptive in nature, a survey was applied. The objective was to map the consumption of functional foods in a sample of this population. As previously discussed, little is known about functional food consumers in developing countries. The survey was conducted in Porto Alegre, capital of Rio Grande do Sul state, located in south Brazil, on the border with Argentina and Uruguay. The city of Porto Alegre has 1.3 million inhabitants and it is considered the city with highest quality of life in Brazil by the United Nations (UN). Its quality of life indicators are highlighted in the main indices of human development: health, sanitation, education, environment and economy, therefore a potential consumer market for functional foods.

3.2 Survey: Data collection

The survey was conducted with 450 consumers in Porto Alegre, and we aimed to assess consumers' motivations, attitudes towards functional foods and purchase intention to consume it. Churchill (1999) and Malhotra (2001) comment that the method of cross-sectional survey is the most popular and widely used in descriptive research, and it is characterized by collecting information from a sample of the population only once. The method provides a "snapshot" of the variables of interest at a given moment in time.

Consumers were approached by trained researchers who administered the questionnaire personally, with the aid of scales and printed material support. The interviews took place over one week (from 18-24

October 2010), in sites close to supermarkets and stores specializing in food products. In total, 25 sites were selected within the city grounds, aiming to obtain greater variability in the sample. However, to comply with the proposed objective investigation, only consumers reporting to effectively consume functional food were interviewed. To assure the understanding of the concept, a written definition of functional food was provided to the respondent at the beginning of the interview, along with examples of real products. If the respondent had confirmed the consumption of any of the products cited, she/he was immediately recruited, beginning the interview.

The questionnaire was based on European studies of Urala and Lahteenmaki (2004, 2007), who developed a scale to measure attitudes specifically in relation to functional foods. In particular, it is important to note that in this study, for cultural reasons (and already documented in previous studies conducted in Brazil) items that contained potentially negative meaning were reversed to positive statements. Brazilian consumers are rather optimistic about life and have difficulties in dealing with reversed items. For them, it seems difficult to disagree with this kind of “negative” alternatives, whose answers are usually located in the extreme left of the scales.

In our questionnaire, the first question investigated the frequency of consumption of functional foods, followed by set of questions related to motivations to consume, trust in the innovation system agents and attitudes towards functional foods. Scales of general health interest (Roininen et al., 1999), the natural product interest (Roininen et al., 1999) and food neophobia (Pliner and Hobden, 1992) were also investigated, but are described somewhere else (work in progress). Finally, in the last section of the questionnaire socio-demographic questions about the respondents were asked.

3.3 Data Analysis

Data were initially treated aiming to detect possible non-random missing data and outliers. Normality and multicollinearity check were also applied aiming to reduce any “noise” that could negatively interfere with further analysis. No problems were identified in this stage. Following this stage, univariate and multivariate statistics analysis were performed using the software SPSS v18.0. Reliability of the scales was tested using Cronbach's alpha measures, where values higher than 0.8 means a highly satisfactory result.

In order to analyse the structure of attitudes towards functional foods and to reduce observable variables them into latent ones – factors - an exploratory factor analysis (EFA) was applied. A Varimax Rotation Method was performed, and the matrix and factor loadings are presented in the results section. A factor loading is the correlation between a variable and a factor that has been extracted from the data, and loadings above 0.4 are good indicators of this fit. The KMO is another important indicator in EFA, as it measures the sampling adequacy, which should be greater than 0.5 for a satisfactory factor analysis to proceed. The Bartlett's test of sphericity is also significant at $p=0.000$, indicating that the correlation matrix is not an identity matrix, a positive signal for the analysis.

Next, we performed the implementation of a two-stage sample segmentation task through cluster analysis. Respondents' grouping criteria were the variables from the attitudes towards functional foods. After initial implementation of hierarchical cluster analysis (stage I), the k-means procedure implemented on the hierarchical clusters' centroids followed, with the option of identifying 2–5 clusters (stage II). The 3-cluster solution was finally selected as the one with the highest correlation between the hierarchical and the k-means cluster membership variables (Pearson correlation 0.987, $P < 0.001$). The profile of each of the three clusters was developed by cross-tabulating the cluster membership variable and the socio-demographic, attitudinal and consumption frequency variables. Chi-square and Duncan and Scheffe post hoc ANOVA tests substantiated statistically significant differences among the three clusters. Interpretation of results and conclusions are presented in the next sections.

4 Results

4.1 Factors influencing food consumption in Brazil: facts and emerging trends

In this section, we are going to investigate (through secondary data) factors influencing food consumption in Brazil. It is very important to understand the main facts and emerging trends in this market, since consumption of functional foods is highly related to this larger picture.

Facts

Brazil is a big country, with an emerging and growing consumer base, strong, growing economy and a strategic role in South America. Agriculture plays an important role in the country's economy, accounting for 10% of GDP and 40% of Brazilian exports. The country is the world's leading producer of meat (beef,

poultry, pork), coffee, sugarcane, soybeans and oranges. (Datamonitor, 2010).

Demographic changes are taking place, as the country is aging quickly and seeing dramatic changes in its population distribution. Life expectancy has increased in past decades due mainly to an improvement in the quality of life and advances in medicine and health care. There is an increasing interest in more sophisticated and health-oriented products (Euromonitor, 2007), and as such, nutraceuticals and functional foods in Brazil offer real promise. The population is becoming more educated, which have an impact on food consumption patterns. Higher education is usually associated with the regular consumption of a wider variety of foods (De Barcellos et al., in press) and it implies facilitated access to information, which makes consumers more discerning and concerned about the foods they eat. Income is rising and the economic power of social classes C, D and E is facing rapidly and steady growth. Wealthiest consumers can spend more money in fruits and vegetables, as well as other premium and healthy food, due to their higher concern with health and shape. Hence, increased disposable incomes make Brazil a potential and attractive market for food producers and retailers.

Brazil has currently over 60 million families or 191 million people and the Brazilian Institute for Geography and Statistics (IBGE, 2008a) forecasts that the population will surpass the 210 million mark by 2025. Being a highly urbanized country with 81% of the population living in urban areas (IBGE, 2007) gives Brazilians a metropolitan and not always healthy way of eating. A sedentary lifestyle is slowly adding extra pounds to the population as well as increasing the incidence of chronic, non-communicable diseases such as cardiovascular disease, diabetes, and cancer. Since the 1960s, cardiovascular diseases have become the leading cause of death in Brazil; today, they account for about two-thirds of the total deaths for known causes in the country (Barreto et al., 2005). In 2007, 44% of the population over 18 years old was overweight and 22% of the population was obese, predominantly women, those with low-incomes, and rural residents (IBGE, 2007).

On the other hand, a good portion of the population is obsessed with a slim, desirable and young body image, relying heavily on plastic surgery, weight-loss diets, medications, and dietary supplements (Leibing, 2004). This group consists primarily of high-income women living in urban areas in the South and Southeastern regions. In this group, the obesity rate has dramatically decreased in recent years (Coutinho et al., 2002; Barreto et al., 2005).

From a sociological standpoint, ethnicity plays an important role in influencing Brazil's patterns of food consumption and purchases. Because of the ethnic diversity, tastes and preferences vary across Brazil. The diversified cultural and ethnic backgrounds favour innovative attitude toward food products. Brazilians enjoy different and unique flavours and are open to trying new products (De Barcellos et al., 2009).

Food for Brazilians is a source of pleasure and family gathering. In general, Brazilians love talking about food and nutrition and they are information seekers. They would like more advice on healthy eating and believe food labels should provide information on nutrition claims or any other consumer-friendly interpretation of the nutrition information available on the package (Coutinho et al., 2002).

Emerging trends

The functional food industry in Brazil had a growth rate of 11% in the period 2006 and 2007, with a market size estimated at over US\$ 6 billion (Euromonitor, 2007). There is much potential for growth, which is increased by an aging and more educated population, attentive to information about nutrition and health. For instance, sales of health and wellness food and beverages are expected to record a good performance in the 2009-2014 period driven by better economic indicators, such as low unemployment, low inflation and higher disposable income. It is expected that improvement in purchasing power amongst the middle classes will also have a major impact on the performance of better for you, naturally healthy and fortified/functional products in the near future as the penetration of these kinds of products is currently still low among lower-income demographics (Euromonitor, 2010).

Beverages are one the most popular sectors in functional/fortified products in Brazil. They have a convenient format which can be consumed on the move, and therefore tap into key consumer demand patterns of health, convenience and portability. The sector is furthermore led by major drinks multinationals PepsiCo and The Coca-Cola Company, which are able to invest considerably in the development, marketing and distribution of these products. Due to fierce competition in standard products and growing interest among consumers for healthier food and beverage alternatives, these companies saw the opportunity to invest in value-added products. (Euromonitor, 2010).

Supermarkets/hypermarkets accounted for the bulk of sales of health and wellness food and beverages. Large retailers have been investing in health and wellness private labels. For instance, Grupo Pão de Açúcar released its Taeq brand in 2006, Carrefour launched Viver in 2007 and Wal-Mart released Sentir

Bem in 2009. These private labels are available in a wide assortment of products that include light, diet, soy-based products, organic and fortified/functional food and beverages (Euromonitor, 2010). Nevertheless, healthy specialist stores have slowly gained share over grocery stores in the review period. This latter channel saw an opportunity to sell products and brands that are usually not available in grocery stores such as food intolerance and organics and there are many health specialist stores opening mainly in urban centres.

Yet, data on Brazilian consumer behaviour toward functional foods is scarce, which presents a great opportunity for us to investigate this issue. It is clear that consumers living in urban areas, with more exposure to media and information channels, are becoming increasingly aware of the health impacts of the diet as a whole and particularly about certain food products. Some studies also show that the Brazilian mature and elderly population, with higher levels of education and access to information, tend to make the connections between a healthy diet and disease prevention more often than other age groups. They characterise healthy eating as a variety of fruits, vegetables, grains and lean meats, while reducing consumption of fatty, deep-fried and sugary foods (Lima-Filho et al., 2008).

Communication strategies are very important in the promotion of functional foods in Brazil since the population shows a lack of understanding and knowledge in this area, especially regarding health claims. For example, a recent study conducted in Rio de Janeiro showed that consumers were confused about the role and health benefits of probiotic foods (Viana et al., 2008).

Brazil is the only country in Latin America that has a well-defined regulatory framework for functional foods and health claims. ANVISA Brazil agrees that safety is a priority and should be based on risk analysis (Lajolo, 2002). Some of the functional foods with approved health claims in Brazil are spreads with phytosterols, milk containing omega-3 fatty acids, milk with prebiotics, and probiotic products.

4.2 Functional Products available at large retail chains in Porto Alegre

Answering one of our objectives, Table 3 reveals a selection of functional food/enriched/fortified products available at the retail market in South Brazil.

Table 1.
Functional/Enriched/Fortified products available at large retail chains in Porto Alegre

Category/ Food Product	Benefit	Brand/Company (status*)
Dairy Products		
Cheese (Minas Frescal)	Gut health - Probiotics (<i>Bifidobacterium lactis</i>)	SanBios/Santa Clara (L)
Cheese (Petit suisse) Strawberry	Antioxidants, Bone health (zinc, protein, iron, vitamins, calcium)	Danoninho/ Danone (MN) Batavinho/ Batavo (LO) Vigorzinho/ Vigor (LO) Piazinho/ Piá (LO)
Fermented milk (natural, fruits, frozen)	Gut health - Probiotics (<i>Bifidobacterium animalis</i> / <i>Danregularis</i> / <i>L casei</i> <i>defensis</i>)	Activia/ Danone (MN)
Fermented milk	Gut health - Probiotics (<i>L casei shirota</i> , <i>L paracasei</i> , <i>Bifidobacterium animalis</i>), Antioxidants (zinc, vitamins A, C, D, E), Bone health (calcium)	Yakult/Yakult (MN) Ninho soleil/ Bliss/Chamyto/Nestlé (MN) Corpus Vitacal/Activia/ Danone (MN) Batavito/ Bob Esponja/Batavo (LO)
Skimmed yogurt (natural, fruits)	Heart health (Plant sterols)	Pro-activ Becel/Unilever (MN)
Whole/Semi-skimmed yogurt (fruits)	Gut health - Probiotics (<i>Lactobacilos acidophilus</i> and <i>Bifidobacterium lactis</i>)	Biofibras/ Batavo (LO)
Yogurt (natural, fruits)	Antioxidants, Bone health (calcium, vitamins A and D)	Plena/Piá Gurt / Piá (LO)
Yogurt	Gut health - Probiotics (<i>Lactobacilos acidophilus</i> and <i>Bifidobacterium lactis</i>)	Piá Essence/ Piá (LO)
Milk drink	Antioxidants, Bone health (calcium, iron, magnesium, activen E (vitamins and salts)	Nescau/ Neston/Nestlé (MN)
Enriched UHT Milk (skimmed, semi-skimmed, whole)	Antioxidants, Bone health (calcium, vitamins A, C, D, iron, collagen)	Elegê/ BR Foods (LO) Batavo/BR Foods (LO) Molico/ Nestlé (MN) Ninho soleil/ Nestlé (MN)
Products with Soy		
Soy drink/ Soy yogurt	Antioxidants, Bone health (calcium, soy protein, vitamins B, C, D, E)	Nutrikids/Ades/Ades (MN) Mais Vita/ Yoki (LO) Soy/ Olvebra (LO) Nutrisoja/Naturis/ Batavo (LO) Sollys/Ninho Soleil/Nestlé (MN)
Green tea with soy	Antioxidants, Bone health (calcium, vitamins C and D)	Soy Tea/ Olvebra (LO)
Spreads		
Margarine	Heart health, Antioxidants (omega-3 and 6, folic acid, vitamins A, B, D and E)	Doriana/ Gessy Lever (MN) Delícia/Cyclus/ Bunge (LO) Qualyvita/ Sadia (LO) Becel Original/ Unilever (MN)
Margarine	Heart health (Plant sterols)	Pro-Active/Becel (MN)
Cereals		
Bread (multi-grain, rye-bread)	Hearth and gut health, Antioxidants (fibre, protein (collagen), omegas-3 and 6, vitamins B, C and E, iron, zinc)	Multigrain/Benefice/Seven Boys (LO) Vitta Natural/ Nutrella (LO) Roggenbrat/ Lizamenbrot/ Nutrella Bread's/Bread's (LO)
Pasta	Isoflavone (soya and calcium)	Activita/ Adria (LO)
Rice	Gut health, antioxidants (Fibre, iron, protein, vitamins)	Ritto/ Mãe Terra (LO) Ráris/ Mars (LO) + Vita Tio João/Josapar (LO)
Corn flakes	Antioxidants (iron, calcium, zinc, vitamins B, C, pantotenic acid, niacin and phosphorus)	Snow Flakes/ Gold Mel/ Moça Flakes/ Nescau /Corn Flakes/ Nestlé (MN)
Cereal Bar	Antioxidants, Energy (with Açai berry and Guaraná)	Ritter Light/Ritter (LO)
Drinks		
Energy drinks	Brain health - mood (taurine, caffeine)	Red Bull (MN) Burn/Coca-Cola (MN) Monster energy (MN) All Need (LO)

*status is defined as LO if the company's capital is local (Brazilian) and MN if the company is a multinational

In accordance with preliminary secondary data presented, dairy products constitute the biggest category available in the shelves. From UHT milk to a variety of yogurts and fermented milks, consumers from South Brazil find different options, supplied either by traditional multinationals (such as Danone Activia and Yakult) or by local industries (such as Piá and Santa Clara). One interesting example of innovative yogurt with probiotics produced by a local industry is Piá Essence. The brand offers traditional (such as strawberry and natural) as well as unique flavours, as tea essence flavoured products (Passion Fruit with Chamomile, Red Grape with Sage and Strawberry with Green Tea). The company is succeeding in competing with the big players.

Cereals and bakery also indicate a significant presence of local companies developing innovative functional food products. For instance Seven Boys launched the brand Benefice (bread loaf) with collagen, targeting middle age females. Josapar extended its traditional rice brand Tio João to Tio João + Vita, adding vitamins to the product. Even at the energy drink category, usually dominated by multinationals, the presence of local food industry is now seen.

Functional food or drink products promoting weigh control or improvements in the physical appearance were not identified in the market of South Brazil, although available in supermarkets' shelves from developed countries.

4.3 Results from Functional Food Consumer survey in Porto Alegre

In this section we present the results from the consumer survey held in Porto Alegre, South Brazil. First, the socio-demographic profile of the sample is presented, followed by their habits, motivations and attitudes towards functional foods.

Demographic profile of the sample

The sample is predominantly feminine (68.2%), corresponding to 307 of the 450 interviewed individuals. Men therefore represent 31.8% of the total. In terms of age, most respondents are adults from 25 to 64 year old, being 43.8% between 25 and 44 years and 34% between 45 and 64 years old. The smallest group was composed by respondents above 65 years old (9.1%) and younger than 24 years old constituted 13.1% of the sample. Respondents with secondary completed education represented 38.7% of the sample, followed by 33.6% of individuals with superior education (university degree). Respondents with primary school were 11.8% and a minority had technical education (6.4%). Respondents with post-graduate degree are nearly 10% of the total.

The question about household situation helped us understand their familiar structure. 23.8% of the sample lives with its spouse/husband while 16.4% live with their parents. 14.7% live alone and 9.8% live with their sons/daughters. 7.3% live with their spouse and kids. Only 3.1 % live with friends, indicating a predominantly familiar structure. In terms of number of people living at the residence respondents indicated households with 2 to 4 residents in 76.4% of the cases, in which 29.3% have only 2 persons. These results indicate small family units. Such information, combined with monthly household income next presented reinforces the indicative of high per capita income and consequent high purchasing power. People living alone represent significant 14.9% of the sample, and respondents living with 5 or more people are only 8.7%. Finally, with an almost egalitarian division, household income between US\$ 1.750 and US\$ 3.000 and above US\$ 3.000 are respectively 29.8% and 24.9% of the sample, indicating that more than 50% of the sample have economic conditions to buy food products with added value. However, most of respondents still have a declared income between US\$ 600 and 1.750 (38.4% do total). The lowest grade (up to US\$ 600) was declared by only 6.9% of the sample.

Frequency of consumption and motivations to consume

The first question the interviewed individuals answered refers to the frequency they consume functional food. Table 5 presents the results.

Table 2.
Frequency of consumption of functional food in Porto Alegre

	Frequency (%)	Number (n)
Daily	64,4	290
Weekly	27,1	122
Fortnightly	4,9	22
Once a month	2,7	12
Rarely	0,9	4
Total	100,0	450

Frequency of consumption is overall very high, since 64.4% of the 450 respondents indicated to consume this food category on a daily basis, while 27.1% consume it weekly. Together, both groups represent 91.5% of the sample, indicating familiarity and penetration of functional food in the households of consumers from South Brazil.

To help in the maintenance of a healthy gut function was the most cited motive, followed by general health and wellness motivations, indicating that consumers from South Brazil are expecting to find these benefits through healthy eating – a good news to functional food industry. To enhance the physical and mental performance were also mentioned, indicating good opportunities in the development of mood food, not only through energy drinks. Motivations to reduce cholesterol and prevent diseases were also indicated, although with lower means. Motivation by habit/tradition was less cited together with the reason to improve physical appearance and to control appetite and body weight.

In fact, these results are aligned with the findings from retail, since probiotics and fibres are the most common categories available. Communication strategies from multinationals are also responsible for the popularity of probiotics: Benefits to gut health from Activia, Danone were massively informed to consumers by propaganda (tv, magazines, newspapers) and at sale points, contributing to consumer information and stimulating their consumption. In addition, Brazilian market (different from the Japanese, for instance) have very few functional food options aiming at the beauty function and potential weight control. Fibres, in this regard, are commonly used aiming at the good functioning of the intestines, and not as much claimed as weight control and sense of satiety.

Attitudes towards functional foods

Results indicate a positive attitude towards functional foods from individuals interviewed in Porto Alegre. Most answers presented means above 5.0 on a 7-point scale and items highly ranked were associated to health and wellness provided by functional foods. These ones, besides being the main motivations are particularly important to women, as indicated by previous studies. (Bech-Larsen; Scholderer, 2007; Frewer et al., 2003). Since in this survey women are the majority, such result is somehow confirmed.

To further investigate this issue an exploratory factor analysis (EFA) was performed, aiming to identify the main dimensions within attitudes towards functional foods in South Brazil. The obtained matrix and respective factor loadings are presented in the following table.

Table 3.
Exploratory Factor Analysis of the Attitudes towards Functional Food in South Brazil: Factors and Loadings

Factors	1 Reward (FF Rew)	2 Trust (FF Tru)	3 Medical (FF Med)
The idea that I can take care of my health by eating functional foods gives me pleasure.	0,831		
Functional foods are absolutely necessary	0,830		
Functional foods make it easier to follow a healthy lifestyle	0,828		
I can prevent disease by eating functional foods regularly	0,812		
The benefits promoted by functional foods are real	0,804		
My performance improves when I eat functional foods	0,78		
The growing number of functional foods on the market is a positive trend for the future	0,769		
Even for a healthy person, the consumption of functional food is necessary	0,754		
Functional foods can repair the damage caused by an unhealthy diet	0,685		
Functional foods help to improve my mood	0,677		
The safety of functional foods has been very thoroughly studied		0,778	
The consumption of functional foods is completely safe		0,768	
I believe that functional foods fulfil their promises		0,746	
It is important to add benefits (as vitamins, probiotics, omega-3) to otherwise unhealthy food		0,733	
The functional foods benefits of to health are clear		0,704	
It is great that modern technology allows the development of functional foods		0,703	
Functional foods are high-technology products		0,695	
Functional foods promote my welfare		0,694	
Not enough information is being given about the benefits of functional foods		0,605	
Functional foods are consumed mostly by people who have real need for them			0,766
Even if If used in excess, functional foods cannot be harmful to health			0,762
I am prepared to compromise on the taste of a food if the product is functional			0,698
I actively seek out information about functional foods			0,673
I prefer to eat foods with medicine-like effects			0,549
Reliability of the attitudes' factors (Cronbach's alpha)	0,958	0,938	0,824

As indicated in the rotated matrix, three factors were generated, which explain 70.85% of the phenomenon. Besides the clear dense factor loadings the Kaiser-Meyer-Olkin (KMO) and Bartlett's test indicated significant results in 0.961 ($p = 0.000$).

Our results are somehow similar to those found by Urala and Lähteenmäki in 2004 and 2007, which identified four attitude factors towards functional foods in the 2004 study (*reward from using functional food* - FF Rew, *confidence in functional food* - FF Con, *necessity for functional food* – FF Nec, and *functional food as medicine* FF Med) and four factors in 2007 (*reward from using functional food* - FF Rew, *confidence in functional food* - FF Con, *necessity for functional food*- FF Nec and *safety of functional foods* FF Saf).

In our case, we found three factors in a particular combination. Factor 1 "*reward from using functional food*" (FF Rew) is the strongest, linked to the benefits of wellness and health coming from functional foods consumption, as found in the original studies. Factor 2, named "*trust in functional foods*" (FF Tru) combines items reflecting consumers' confidence and safety in functional foods, both in its function and in relation to risk of use. Aspects related to technology are gathered in this factor. Finally, factor 3 "*functional food as medicine*" (FF Med) would be equivalent to the original factor found by the authors in 2004 combined with the "*necessity*" factor, indicating that in this case, consumers choose functional foods mainly due to their medicinal benefits. One possible explanation for the unification of these concepts into

three factors in relation to the original study may be the incipient stage of market development in South. Although familiar to some product categories (such as probiotics, as described earlier), consumers may not properly discriminate between the factors and technical aspects related to the product. Brazilian regulation body ANVISA in regard to functional food labeling is quite strict, and the use of claims is not potentially used as it would be desirable, in order to stimulate consumer’s information about the benefits of available products.

Cluster analysis

Three clusters were identified in this study as “Mature wellness-oriented” “Young, beautiful and healthy” and “Typical”. Tables 5 and 6 summarize the cluster profiles in terms of a) socio-demographic characteristics and consumption frequency, and b) on motivations, attitudes towards functional foods and trust in the agents of the innovation system.

Table 4.
Cluster profiles in terms of socio-demographic characteristics (percentages)

Socio-demographic profile			Cluster 1 N ₁ = 218	Cluster 2 N ₂ = 138	Cluster 3 N ₃ = 93	Sample N = 449
		Sig.	48.6 %	30.7%	20.7 %	100%
Frequency of consumption	Daily	**	70.2	71.0	40.9	64.4
Gender	Female	n.s.	70.2	68.8	62.4	68.2
Age	+45 years old	**	50.0	32.6	41.9	43.1
Household status	Living alone	n.s.	18.9	12.7	14.1	14.7
Education	University or beyond	n.s.	42.2	41.3	48.4	43.2
Income	Well off	**	28.9	18.1	25.5	24.9

Note: Chi-square tests with **: $p < 0.01$; n.s.: not significant

The socio-demographic profile indicates that cluster 1 (hereby called “mature wellness oriented”) is mainly composed by women, aged 45 years-old or more, with the high income. Most of them consume functional foods on a daily basis. Respondents from cluster 2 are mainly female as well, with the highest proportion of daily consumption of functional foods. Although their educational level is also high, their income and age is significantly lower than the others. They are therefore called “Young, beautiful and healthy”. Cluster 3 has the highest frequency of men amongst the three clusters. Results reveal that cluster 3 (“Typical”) is closer to the sample average for almost all the attitudinal items. In terms of their attitudinal profile, Table X presents the results.

Table 5.
Cluster profiles in terms of motivations to consume, attitudes towards functional foods and confidence in the FF innovation agents

Scales	Sig.	Cluster 1 N ₁ = 218 48.6 %	Cluster 2 N ₂ = 138 30.7%	Cluster 3 N ₃ = 93 20.7 %	Sample N = 449 100%
Motivations to consume (Alpha=0.914)					
Habit or tradition	**	4.30	3.81	2.97	3.87
To keep a healthy lifestyle	**	4.56	4.06	3.20	4.12
To prevent diseases (in the individual or family)	**	4.37	3.80	2.95	3.90
To control appetite and body weight	**	4.11	3.43	2.89	3.65
To increase wellness	**	4.50	4.00	3.09	4.05
To improve physical appearance	**	4.28	4.64	2.99	3.82
To increase mental and physical performance	**	4.49	3.95	3.08	4.03
Gut health/flora equilibrium	**	4.54	4.13	3.27	4.15
To reduce cholesterol/heart diseases	**	4.55	3.64	3.02	3.95
Attitudes towards functional foods (3 dimensions see pg x)					
Reward from using functional foods (Alpha=0.958)	**	6.25	5.39	3.67	5.46
Trust in functional foods (Alpha=0.938)	**	5.94	5.19	3.73	5.25
Functional food as medicine (Alpha = 0.824)	**	5.59	4.08	3.14	4.62
Confidence in the FF innovation system agents (Alpha=0.921)					
Health professionals	**	5.66	5.15	5.58	5.49
Dieticians/Nutritionists	n.s	5.68	5.57	5.55	5.62
Pharmaceutical/medical industry	**	4.98	4.45	4.68	4.73
Retailers	n.s	4.82	4.74	4.71	4.77
Food industry	n.s	4.72	4.56	4.70	4.67
National Health Authorities	n.s	5.27	5.09	5.17	5.19
Scientists/Researchers	**	5.62	5.33	5.03	5.41
Media (Television)	*	5.04	4.65	4.92	4.90

Note: ANOVA tests with *: $p < 0.05$; **: $p < 0.01$; n.s.: not significant.

All items measured on a 7-point scale with end points 1 = "strongly disagree" to 7 "strongly agree".

In terms of motivations, results reveal that consumers from Cluster 1 consume functional food to *keep a healthy lifestyle* and to *increase wellness*, whilst consumers from Cluster 2 wish to *improve their physical appearance* (what fits their socio-demographic profile in terms of gender and age). Cluster 3 represents the typical functional food consumer in Brazil, whose motivations to consume are mainly related to *gut health and gastrointestinal equilibrium* provided by probiotics and fibres, especially considering the availability of functional food products in the supermarkets. Individuals from this segment are also motivated to consume in order to keep a healthy lifestyle and to increase wellness, although they are *not* motivated to consume simply due to *habit or tradition*, *to prevent diseases*, *to control appetite* or *improve their physical appearance*. That is, this group has a more general *wellness* motivation to consume, and probiotics is their preferred category. From a marketing view, clear differentiation strategies can be used, according to the target group.

In specific, attitudes also reveal significant differences between groups: women from clusters 1 and 2 are mostly favourable for the *reward* they can get from functional foods, whilst consumers from cluster 3 do *trust* in the benefits provided. This last group trust *health professionals* and *food industry* above the average. Women from clusters 1 and 2 have confidence in their *dieticians/nutritionists* above all, but they also trust in *scientists/researchers*.

5 Conclusions

In general, the scenario for functional foods in Brazil is highly positive. The functional food industry in Brazil had a growth rate of 11% in the period 2006 and 2007, with a market size estimated at over US\$ 6 billion (Euromonitor, 2007). There is much potential for growth, which is increased by an aging and more educated population, attentive to information about nutrition and health. For instance, sales of health and wellness food and beverages are expected to record a good performance in the 2009-2014 period driven by better economic indicators, such as low unemployment, low inflation and higher disposable income.

Our survey shows predisposition to consume and highly positive attitudes towards functional foods in South Brazil. Population in general is getting older and their concerns about health are growing accordingly, as indicated by previous studies (Frewer et al., 2003). Moreover, the cultural diversity in Brazil is a passport to innovation and people in Brazil are becoming less passive, more educated, and are showing a higher demand for quality food products. In special women are representing a very significant and important group to the development of functional food products in South Brazil.

Our sample was predominantly composed by women, which according to secondary data, are the main responsible for the purchase of food in the households. Results from this research are therefore effectively characterizing the target-public aimed by the food companies. Interviewed consumers presented positive attitudes towards functional foods and enough purchasing power to buy it. Accordingly, frequency of consumption was generally high, with 64.4% of the sample indicating to consume generic functional food on a daily basis. Yet, availability of functional food products manufactured by local food industries in South Brazil is still incipient compared to the development of functional food products produced by multinationals (that could also be further developed). In that sense, many opportunities are foreseen for the functional food industry in general in Brazil, considering the outcomes from this study.

Cluster analysis indicated three different target segments, presenting specific characteristics that can be better explored in terms of research and development (R&D), marketing and corporate communication strategies. One clear opportunity lies on the group composed by modern, urban Brazilian women, aged 45 years old or more, well off and willing to increase wellness and to follow a healthy lifestyle. The development of functional food products aiming to provide better quality of life, sophistication and enjoyment together with health seems to be the formula designed for them. The second group is the one with younger and beauty conscious/vain women. Although disposing of a lower income compared to women in cluster 1, this group is mainly motivated to consume functional foods that can improve their physical appearance. Yet, there are only a few functional food products in the Brazilian market targeted to such expressive group in Brazilian society, and food industries might be losing the opportunity to innovate. For instance, the development of more products with collagen, antioxidants (both promoting skin beauty) and whey protein (bodybuilder) could help supplying some of this group's demands. Finally, for the most traditional consumers (the "typical" functional food consumers from cluster 3), the development of new products, mainly probiotic-based, might be an option of differentiation in such a competitive food industry. New flavours, new carriers (not only yogurt) from trustworthy sources are likely to be accepted by the market. One example comes from Piá, a local and innovative food industry in South Brazil that has recently launched the first creamy probiotic yogurt (Piá Essence Pedacões with cow's milk) containing pieces of blueberry in Brazil (AGAS, 2011). Although the idea of yogurt with probiotics is not new in the market, the product consistency and flavour is.

In general, we've found that confidence is high in dieticians/nutritionists and health professionals, followed by confidence in scientists and national health authorities. For instance, health professionals could promote positive attitudes about functional foods by providing information about the benefits of these products. Uptake of functional foods may also be encouraged by distributing messages of approval from important groups, such family doctors and personal dieticians. For example, communication with the public about these health products could include messages of endorsement from representatives of medical practitioners or from groups perceived to be peers (O'Connor and White, 2010).

Food industries, pharmaceutical/medical industry, retailers and the media had the lowest confidence rates and this could be explained by consumers' perception of these agents' commercial interest, consequently affecting their credibility. Such results indicate the need for articulation and governance from the agents of the innovation system for functional food in Brazil, aiming to establish a common denominator on the benefice.

In our view, surveys aiming to characterize Brazilian consumers are fundamental to help food local food companies and multinationals to define their strategies. To map the most accepted categories and benefits is also important to avoid the "tentative and error" approach. One of the main motivations found in this study to consume functional food is to *enhance the physical and mental performance*, but very few companies are exploring this idea and developing new products to promote these benefits. Brazil has a rich biodiversity, especially in plants, native energetic compounds and superfruits such as "erva mate" (*Ilex paraguariensis*, a typical "green tea" from subtropical South America), guaraná (*Paullinia cupana*, typical from the Amazon) and açai berry (*Euterpe oleracea*, also from the Amazon region) that could be better utilized in new product development of functional food products. We can say that the functional drink category is the only one exploring this market opportunity, but such products could be incorporated into food products as well. For instance, açai berry has more antioxidants than any other edible fruit on the planet, including 60% more antioxidants than pomegranates and 500% more than blueberries, but

mostly the frozen pulp is available in the Brazilian market, with no claims or added value convenience products. The same rationale is valid for the category of functional foods promoting *beauty and weight management* in Brazil. This category is practically ignored by local food industries and multinationals, in spite the fact that nearly half of Brazilian population is overweight or obese, but willing to lose weight, especially women. More than just low-carb or low-sugar products could be offered.

Finally, as suggested by Urala and Lähteenmaki (2007), regular attitude monitoring is needed to see how the attitudes towards functional foods are developing in emerging markets as Brazil, as the products become more familiar. The structure of attitude scales becomes more stable with the correspondent familiarity of the products: once functional food products approach conventional foods, the scale tend stabilization.

Acknowledgments

The authors acknowledge the financial support of the National Council for Development and Research (CNPq), from the Brazilian Ministry for Science and Technology (MCT) and the financial support and grants sponsored by the Foundation for the Support to Research in Rio Grande do Sul State (FAPERGS).

References

- Ajzen, I., Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes* **50**: 179-211.
- Ashwell, M. (2002). *Concepts of Functional Foods*. ILSI Europe Concise Monograph Series. Ed. Walker, R. Retrieved October 10, 2008, from <http://www.ilsina.org>.
- Bäckström, A., Pirtillä-Backman, A., and Tuorila, H. (2003). Dimensions of novelty: a social representation approach to new foods. *Appetite* **40**: 299–307.
- Barreto, S. et al. (2005). Análise da estratégia global para alimentação, atividade física e saúde. *Organização Mundial da Saúde, Epidemiologia e Serviços da Saúde* **14**: 41-68.
- Bech-Larsen, T., Scholderer, J. (2007). Functional foods in Europe: consumer research, market experiences and regulatory aspects. *Trends in Food Science & Technology* **18**: 231-234.
- Benady, D. (2008). New product launches in the food sector: the recipe for success. *Warc Exclusive April, 2008*.
- Blandon, J., Cranfield, J., and Henson, S. (2007). Functional Food and Natural Health Product Issues: The Canadian and International Context. International Food Economy Research Group Department of Food, Agricultural and Resource Economics.
- Castilhos, C., and Passos, M. (1998). Competitividade e inovação na indústria gaúcha. FEE, 1998.
- Churchill, J., and Gilbert, A. (1999). *Marketing research: methodological foundation*. Orlando: The Dryden Press, 1999.
- Coutinho, D., Monteiro, C., and Popkin, B. (2002). What Brazil is doing to promote healthy diets and activelifestyles? *Public Health Nutrition* **5**(1A): 263-267.
- Cooke, P., Uranga, M., and Etxebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy* **26**: 475-491.
- Cooper, R. G. (1994). New products: factors that drive success. *International Marketing Review* **11**(1): 60-76.
- Coutinho, L., and Ferraz, J. (1995). *Estudo da competitividade da indústria brasileira*. Campinas, Brazil: Papirus.
- Costa, A. I. A., and Jongen, W. M. F. (2006). New insights into consumer-led food product development. *Trends in Food Science and Technology* **17**(8): 457–465.
- Datamonitor (2010). Agricultural Products in Brazil. Industry Profile Report. July 2010: 36p.
- De Barcellos, M.D., Aguiar, L.K, Ferreira, G.C, and Vieira, L.M. (2009). Willingness to Try Innovative Food Products: a Comparison between British and Brazilian Consumers. *Brazilian Administration Review* **6**(1): 50-61.

- De Barcellos, M.D., Kügler, J.O., Grunert, K.G., Van Wezemael, L., Pérez-Cueto, F.J.A., Ueland, Ø., and Verbeke, W. (2010). European consumers' acceptance of beef processing technologies: A focus group study. *Innovative Food Science and Emerging Technologies* **11**(4): 721-732.
- De Barcellos, M.D, Saab, M.S., Pérez-Cueto, F.J.A, Perin, M.G., Neves, M.F., and Verbeke, W. (in press) Pork Consumption in Brazil: Challenges and Opportunities for the Brazilian Pork Production Chain. *Journal on Chain and Network Science*.
- Eagly, A., and Chaiken, S. (1993). *The psychology of attitudes*. Orlando, US: Hartcourt Brace Jovanovich College Publisher.
- Euromonitor (2004). *The world market for functional food and beverages* (January 2004): 63.
- Euromonitor (2007) *State of the Market: Global Health & Wellness Products*. London: Euromonitor, (May 2007): 24.
- Euromonitor (2010). *New health and wellness sales fuelled by developing markets of China, Mexico, and Brazil* (April 2010).
- FAO (2007). *Report on Functional Foods*. Retrieved April 1th, 2008, from <http://www.fao.org>.
- Freeman, C. (1995). The National System of Innovation in historical perspective. *Journal of Economics* **19**: 5-24.
- Frewer, L., Scholderer, J.; and Lambert, N. (2003). Consumer acceptance of functional foods: issues for the future. *British Food Journal* **10**: 714–731.
- Gray, J., Armstrong, G., and Farley, H. (2003). Opportunities and constraints in the functional food market. *Nutrition and Food Science* **33**: 213–218.
- Grime, I., Diamantopoulos, A., and Smith, G. (2002) Consumer evaluation of extensions and their effect on core brand. *European Journal of Marketing* **36**(11/12): 1415-1438.
- Hobbs, J.E. (2001). Developing supply chains for nutraceuticals and functional foods: opportunities and challenges. Proceedings. Seminar "Les consommateurs et le marché des nutraceutiques et des aliments fonctionnels: analyses et tendances socioéconomiques". INAF/CRÉA . November 23, 2001,
- Laval University, Québec, Available at: http://www4.agr.gc.ca/resources/prod/doc/misb/fb-ba/nutra/pdf/ffn-afn_e.pdf. Accessed 15 March 2010.
- Huotilainen, A., Pirttilä-Bäckman, A. M., and Tuorila, H. (2006). How innovativeness relates to social representation of new foods and to the willingness to try and use such foods. *Food Quality and Preference* **17**(5): 353–361.
- Instituto Brasileiro de Geografia e Estatística, (2008). *Projeção da população do Brasil por sexo e idade, 1980 - 2050*. Rio de Janeiro, Brazil: Estudos & Pesquisas, Informação Demográfica e Socioeconômica.
- Instituto Brasileiro de Geografia e Estatística, (2007). *Análise dos resultados: Disponibilidade Domiciliar de Alimentos e do Estado Nutricional no Brasil*. Rio de Janeiro, Brazil: Pesquisa de orçamentos familiares.
- IPA (1994). IPA Guide to Best Practice, Food & Beverages.
- Just Food (2008). Global market review of functional foods – forecasts to 2013. Report.
- Lajolo, F. (2002). Functional foods: Latin American perspectives. *British Journal of Nutrition* **88**(2): 145-150.
- Leibing, A. (2004). The old lady from Ipanema: Changing notions of old age in Brazil. *Journal of Aging Studies* **19**: 15-31.
- Lima-Filho, D.O., Sproesser, R.L., Lima, M.F., and Lucchese, T. (2008). Comportamento alimentar do consumidor idoso. *Revista de Negócios* **13**(4): 27-39.
- Malhotra, N. (2001). *Marketing research: an applied orientation*. Upper Sadle River: Prentice Hall.
- Mark-Herbert, C. (2004). Innovation of a new product category - functional foods. *Technovation* **24**: 713–719.
- Menrad, K. (2003). Market and marketing of functional food in Europe. *Journal of Food Engineering* **56**: 181–188.
- Nelson, R. (1993). National innovation systems: a comparative analysis. Oxford: Oxford University Press.

- O'Connor, E. L., and White, K.M. (2010). Willingness to trial functional foods and vitamin supplements: The role of attitudes, subjective norms, and dread of risks. *Food Quality and Preference* **21**,75-81.
- OECD (1997), National Innovation Systems, OECD Publications, Paris.
- Raud, C. (2008). Os alimentos funcionais: a nova fronteira da indústria alimentar - análise das estratégias da Danone e da Nestlé no mercado brasileiro de iogurtes. *Revista Sociologia e Política* **16**(31): 85-100.
- Rosenfeld, S. 1997. Bringing business clusters into the mainstream of economic development. *European Planning Studies* **5**(1): 3-23.
- Scholderer, J., and de Barcellos, M. (2008). Feasibility study for meat-derived functional ingredients (Restricted). MAPP, Aarhus School of Business, Denmark.
- Schumpeter, J.A (1982). *Teoria do desenvolvimento econômico*, São Paulo: Abril Cultural.
- Siegrist, M., Stampfli, N., and Kastenholz, H. (2008). Consumers' willingness to buy functional foods. The influence of carrier, benefit and trust. *Appetite* **51**(3): 526-529.
- Tripodi, T., Fellin, P., and Meyer, H. (1975). *Análise da Pesquisa Social*. Petrópolis, Brazil: Alves.
- Tuorila, H., and Cardello, A. (2002). Consumer response to an off-flavor in juice in the presence of specific health claims. *Food Quality and Preference* **13**: 561-569.
- Urala, N., and Lahteenmaki, L. (2003). Reasons behind consumers functional food choices. *Nutrition & Food Science*, **33**, 148–158.
- Urala, N., Lahteenmaki, L. (2004). Attitudes behind consumers' willingness to use functional foods. *Food Quality and Preference* **15**: 793–803.
- Urala, N., and Lahteenmaki, L. (2007). Consumers changing attitudes towards functional foods. *Food Quality and Preference* **18**: 1–12.
- Van Wezemael, L., Verbeke, W., Kügler, J.O., De Barcellos, M.D., and Grunert, K.G. (2010). European consumers and beef safety: Perceptions, expectations and uncertainty reduction strategies. *Food Control*, **21**, 835-844.
- Verbeke, W. (2005). Consumer acceptance of functional foods: socio-demographic, cognitive and attitudinal determinants. *Food Quality and Preference* **16**: 45–57, 2005.
- Verbeke, W. (2006). Functional foods: Consumer willingness to compromise on taste for health? *Food Quality and Preference* **17**(1,2): 126-131.
- Viana, J., da Cruz, A., Zoellner, S., and Batista, R. (2008). Probiotic foods: Consumer Perception and Attitudes. *International Journal of Food Science and Technology* **43**(1): 1577-1580.
- WARC. (2011). PepsiCo Plans innovation, nutrition drives data sourced from seeking Alpha. *Additional content by Warc staff, October 11, 2010*.
- Willians, M., Pehu, E., and Ragasa, C. (2006). Functional Foods: Opportunities and Challenges for Development Countries. *Agricultural and Rural Development* **19**.