

Constraints, scope and systematic plan for the awareness, production and commercialization of nutraceutical and functional foods

Nitin G. Suradkar^{1*}, Anjali A. Bhoite² and Abhilasha B. Shingote³

1 & 3. Assistant Professor, MIT School of Food Technology, MIT Art, Design and Technology University, Pune.
2. Professor and I/C Principal, MIT School of Food Technology, MIT Art, Design and Technology University, Pune.

*Corresponding author email id : nitin.suradkar@mituniversity.edu.in

Abstract— Global demand for nutraceutical and functional foods is rising as consumers look for ways to manage their health. Despite increasing demand, there is still a lack of awareness and understanding among consumers about the benefits and usage of nutraceuticals and functional foods. The market for functional food and nutraceuticals is becoming increasingly competitive. Standing out in a crowded market requires innovation, differentiation, and effective marketing strategies. Nutraceuticals are sometimes perceived as expensive, deterring price-sensitive consumers. Communicating the value proposition effectively is crucial to overcome this perception. Although advances in food science and the discovery of new bioactive compounds provide opportunities for developing unique and effective functional and nutraceutical formulations. There is a need for the development of comprehensive educational campaigns through various channels, emphasizing the health benefits and proper usage of nutraceuticals. Collaboration with healthcare professionals, nutritionists, and wellness experts to gain endorsements and recommendations. Exploring partnerships with food industry leaders, research institutions, or academic experts. Establishment of strong relationships with reliable suppliers to ensure a stable and high-quality ingredient supply chain. Investment in technology for real-time monitoring and optimization of the supply chain.
Keywords: Functional food, nutraceuticals, consumer, market, campaigns, supply chain.

I. INTRODUCTION

In 400 BCE Hippocrates the ancient Greek father from the western part of the world allegedly

stated, "Let food be thy medicine, and medicine be thy food". The Indians, the Chinese, the Egyptians are other peoples who have proven that food civilization becomes more scientific in the healing of the disease. The huge advantages of Ayurveda, an Indian health science system based on over 5,000 years of historical knowledge, has long established the medicinal advantages of food. The healing properties of food are something that we have known about, and written about, through the millennia.[1].

The term nutraceutical was first introduced by Dr. Stephen L. DeFelice, founder of the Foundation of Innovation Medicine (also known as FIM) in 1989. Nutraceutical, a combination of the words nutrition and pharmaceutical, is also coined (originally from definitions of pharmacologically active products in DeFelice's, journal) a substance which is not usually recognized as an essential nutrient but which may have diseases preventing properties, reduce the risk of cancer or heart disease, or reduce aging [2].

Functional foods are described as products that resemble traditional food meals however possess validated physiological benefits. However, nutraceuticals are commodities derived from food, but are used inside the medicinal shape of pills, tablets or beverages and again render established physiological advantages. In Canada, the latter organization has now been incorporated below a new category as herbal health products that sell fitness. This category consists of both nutraceuticals and natural in addition to different natural merchandise. In a few countries, however, purposeful meals and nutraceuticals are

used interchangeably. Regardless, the primary cognizance of such merchandise is to improve health and reduce disorder chance thru prevention. The major distinction of this class with pharmaceuticals is that they're multi-focused combos and gift at low concentration whilst prescribed drugs are multi-focused natural compounds with high dose use.[3].

Nutraceutical foods and functional foods are terms often used interchangeably, and both refer to food products that provide health benefits beyond basic nutrition. However, there are subtle distinctions between the two terms.

Nutraceutical Foods:

The term "nutraceutical" is a portmanteau of "nutrition" and "pharmaceutical," emphasizing the idea that these foods offer both nutritional value and potential medicinal or health-promoting benefits. Nutraceuticals can include a broader range of products, not just foods. It is composed of bioactive compounds filled in dietary supplements, herbal products and functional drinks thus having potential health benefits. These nutrients are either derived from food sources or synthesized to include certain bioactive components like vitamins, antioxidants, minerals and other functional ingredients.

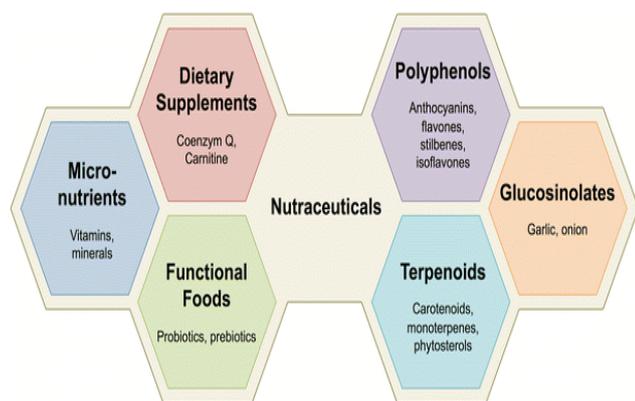


Figure 1. Nutraceuticals.
 Image source- [4].

Functional Foods:

Nutraceuticals form a subcategory of functional foods referring to those engineered or

manipulated for additional health benefits that exceed their normal nutritional value. Inclusion of non-traditional foodstuffs often occurs in such cases where these foods have been enriched with ingredients and components believed to have positive effects on health. Some examples include probiotics, omega-3 fatty acids, antioxidants or any other biological active substances whose use is directed towards enhancing health while preventing or managing specific disease conditions. In general, nutraceutical foods constitute functional foods but not all functional foods qualify as nutraceuticals because the latter term represents a wider scope that involves different kinds of products that could enhance health. Both nutraceutical and functional foods are part of a growing trend in the food industry to combine health and nutrition, providing consumers with options that go beyond basic sustenance to potentially improve overall well-being and prevent or manage certain health conditions. However, consumers should approach these products with a critical mind-set, seeking scientific evidence supporting health claims and consulting healthcare professionals when necessary.

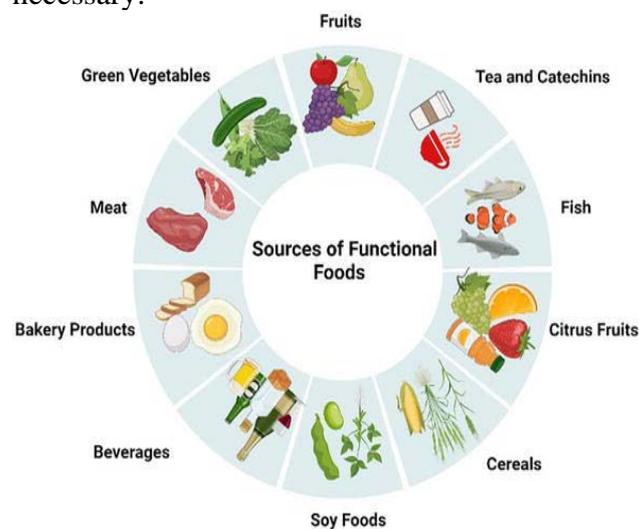


Figure 2. Sources of functional foods.
 Image source- [5].

II. NUTRACEUTICALS AND FUNCTIONAL FOODS ARE DIFFERENT FROM TRADITIONAL FOODS

Table. 1 Difference between the traditional foods, functional foods and Nutraceuticals.

Primary Purpose:	Traditional Foods	Consumed primarily for nourishment, taste, and cultural or social reasons.
	Functional Foods	Designed to provide health benefits beyond basic nutrition, addressing specific health concerns or promoting overall well-being.
	Nutraceuticals	Combine nutritional value with potential medicinal or therapeutic properties, often containing bioactive compounds.
Bioactive Compounds:	Traditional Foods	Contain naturally occurring nutrients and flavours.
	Functional Foods	May include added bioactive components (e.g., probiotics, omega-3 fatty acids, antioxidants) to enhance health benefits.
	Nutraceuticals	Formulated to include concentrated bioactive compounds, often extracted or isolated for specific health effects.
Health Claims:	Traditional Foods	Generally, not marketed for specific health benefits
	Functional Foods	Promoted for their potential to enhance health or prevent/manage specific conditions, supported by scientific evidence.
	Nutraceuticals	Positioned with explicit health claims and often marketed as alternatives or complements to traditional medicines.
Formulation:	Traditional Foods	Typically based on culinary and cultural traditions, with minimal alteration for health purposes.
	Functional Foods	Formulated to include specific health-promoting ingredients or nutrients.
	Nutraceuticals	Formulated with a focus on concentrated bioactive compounds to elicit targeted health effects.
Consumer Perception:	Traditional Foods	Seen as part of everyday meals, reflecting cultural preferences.
	Functional Foods	Perceived as a convenient and palatable way to enhance health through dietary choices.
	Nutraceuticals	Viewed as products with medicinal properties, often consumed with the intent to address specific health issues.
Delivery Formats:	Traditional Foods	Consumed in various forms, often as part of regular meals.
	Functional Foods	Available in diverse formats, including fortified foods, beverages, and snacks.
	Nutraceuticals	Often delivered as supplements, capsules, or concentrated extracts for precise dosage.

III. MARKET SCENARIO

The market for products with functional and nutraceutical properties has grown exponentially as consumer demand increases for natural, low risk alternatives to pharmaceuticals that promote health and wellness. [6]

The Nutraceutical market is currently dominated by the USA, Japan, and Europe, which together keep over 90% of the worldwide marketplace. However, as those markets get toward maturing, industry individuals are turning their attention to

emerging markets, especially the ones in the Asia Pacific region, among them India. The Indian Nutraceutical sector had only 2% of the worldwide market in 2017 and is predicted to be worth \$5 billion by way of the year 2019. However, large boom is expected inside the coming years, with projections indicating that the Indian marketplace will increase to \$11 billion by means of 2023, showing a Compound Annual Growth Rate (CAGR) of 21%. By 2023, India is predicted to hold at least 3.5% of the worldwide marketplace for Nutraceuticals. [7]

IV. CONSTRAINTS

Nutraceuticals and functional food have vast market call for in India and overseas, but it has several obstacles that avoiding it to reach its real marketplace potential in both global and domestic markets. Some of them are

Complex regulatory environment

Strict regulations regarding health claims, labelling, and ingredient approval can pose challenges. Complying with evolving regulatory standards is essential and may require significant time and resources.

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The definition of nutraceuticals varies from country to country according to their regulations. Example: The US defined nutraceuticals as Dietary supplements and Europe as Food supplements. Still, now there is no internationally accepted definition for nutraceuticals. Hence, there is a need for global regulatory synchronization. At present, the ASEAN (Association of Southeast Asian Nations) countries are leading the path by following common regulations [8], [9].

Health claims

Health claims allowed with the aid of distinctive nations vary based totally upon the rules which make it difficult to attain the product for the global market. Example: FSSAI law does not permit prevention claims, whereas different international locations permit prevention claims.

Challenges faced by new players

It is hard for brand new players to enter the nutraceutical territory and to avail subsidies as there is no regulatory device for setting up production flowers. The great and pricing also

emerge as an issue as nutraceuticals are categorised as either ingredients or drugs.

Research and Development Costs

The investment required for research and development to formulate effective nutraceuticals can be high. This can be a constraint, especially for small and medium-sized enterprises. [10]

Consumer Education

Lack of awareness and understanding among consumers about the benefits and usage of nutraceuticals and functional foods may slow adoption. Education campaigns are necessary but can be resource-intensive.

Market Competition

The market for nutraceuticals is becoming increasingly competitive. Standing out in a crowded market requires innovation, differentiation, and effective marketing strategies.

Supply Chain Complexity

It is difficult to get good ingredients and maintain a stable supply chain when they rely on exotic or seasonal components.

Perceived Cost

Sometimes nutraceuticals are considered very expensive making them not attractive to price sensitive people. This perception can only be addressed by properly communicating the value proposition to consumers.

V. SCOPE

Nutraceutical and functional food sectors in India have been showing significant development trends as well as having a wide range of opportunities for growth. Many factors are responsible for the expansion of these industries, including:

Health and Wellness Trends

There is an upsurge of global interest in health and wellness that has provided a huge area for nutraceuticals. Health-conscious individuals are looking for products that prevent diseases while offering health benefits.

Customization and Personalization

Customized nutraceuticals are possible that address specific health needs or demographic requirements. Personalized nutrition is the new trend that allows targeted products to be made available in the marketplace.

Innovation in Ingredients

Opportunities are created by advances made in nutritional science as well as discovery of new bioactive compounds which could result in unique and effective nutraceutical formulations.

Collaboration with Healthcare Professionals

Incorporating healthcare professionals' support into endorsement can increase credibility of the nutraceutical products being sold by companies.

E-commerce Growth

The rise of e-commerce facilitates a broader reach, allowing nutraceutical companies to access a global market and reach consumer.

VI. SYSTEMATIC PLAN

Making a strategic plan for functional foods and nutraceuticals awareness and production in India will involve various aspects of the industry inclusive of consumer information, regulatory support, capacity creation, and market development.

Research and Development

Invest on continuous research to identify and include scientifically proven ingredients that have clear health benefits. Collaborate with research institutions or enter into innovative partnerships.

Regulatory Compliance

Keep track of changing regulations and liaise closely with regulatory bodies on compliance. Seek legal and regulatory experts to deal with complex requirements.

Consumer Educational Campaigns

Develop all-inclusive education campaigns via several mediums stressing on health advantages associated with nutraceuticals use. Make use of social media, blogs, as well as form alliances with health influencers to reach out to many more people.

Market Differentiation

Make your products different from others through unique formulations, quality certifications or sustainable sourcing practices. On marketing materials highlight specific features which make your products stand out from others in the market.

Strategic Partnerships

Join hands with healthcare professionals, nutritionists or wellness gurus for endorsements or recommendations. Look into alliances with food business leaders.

Supply Chain Optimization

Build strong relationships with reliable suppliers so as to ensure stable and high-quality raw material supply chains. As well, use technology to monitor and optimize the supply chain in real time.

Digital Marketing and E-commerce

Utilize digital marketing techniques to building awareness and driving online sales. Similarly, make e-commerce platforms more user friendly for customers across the globe.

Consumer Feedback and Adaptation

Keep gathering feedback from consumers on products to improve on them regularly in

response to changing needs of the clients. It is therefore important for a business organization to be flexible enough to adjust itself along with market trends by capturing these findings during product development.

VII. CONCLUSION

In addition to some limitations, the future of nutraceuticals and functional foods has very good prospects indeed considering an array of various foodstuff that exist in countries like India. One thing about India is its rich biodiversity that has given rise to a wide range of crops, herbs, medicinal plants or spices that may have nutraceutical or functional food applications. This variety potentially forms a massive base for production of new innovative products meant for various health concerns. Besides, it should be noted that India possesses age-old traditional medicine systems such as Ayurveda, Siddha and Unani which have used herbs and food sources therapeutically for centuries before modern knowledge surfaced.

This repository of ancient wisdom forms the basis of today's nutraceutical research and delivery. Consumers all over the world are becoming more health-conscious and seeking more than just basic nutrition and are looking for products that can offer health benefits. In response to this, products such as nutraceuticals and functional foods, which can offer extra health-enabling substances, stand to take even greater advantage of consumers who wish to ward off disease. Governments in developing countries such as India have woken up to the prospects of nutraceuticals and functional foods for bringing about health benefits among the masses. Expanding research and potential work on the market potential of being done, as soon as you have more work on the patched and noted growth. As the economies grow and disposable income rise the consumers are more open to

spending on products promoting good health and well-being. This represents a large potential market for nutraceutical and functional food manufacturers.

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