
UNIT 1 FOOD BASICS

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1.0 OBJECTIVES

After reading this Unit, we shall be able to:

- define the terms: food, food chain, food safety and food trade;
- relate different types of food based on functions and compositions;
- describe the food constituents, their properties and importance; and
- comprehend the issues related to food policy, consumption trends and food safety.

1.1 INTRODUCTION

All living beings need a steady supply of food to take care of the body's requirements. It includes the physical sustenance, growth and tissue repair. The food contains nutrients in the form of chemical energy that the living beings can absorb. The food basket of the human beings in the global scale is wide with a variety of produces and items. The food which a person eats is

termed as the 'diet'. The diet must provide a complete range of nutrients to ensure healthy living to the person. Although all foods provide some or all of these nutrients, but no single food item contains all the required nutrients in optimum quantities.

The food spectrum of human beings begins with the mother's milk and diverges to different forms of food (raw, minimally processed, semi-processed, cooked, smoked, grilled, roasted, fried, stirred, steamed, frozen, dried/dehydrated, soaked, germinated, fermented, etc.).

The foods we eat come from either plants or animals. Among the fifteen main groups of food commodities recognized by FAO, nine are of plant origin, four of animal origin and two of both plant and animal origin. The foods of animal origin comprise meat and offal, milk, eggs, fish and sea foods. Foods of plant and animal origin include sugars & honey and oils & fats (including butter, lard and tallow).

Food items of plant origin comprise food grains (cereals: wheat, rice, coarse cereals like corn, sorghum, millets, etc.), legumes (pulses: red gram, black gram, green gram, beans and horticultural produce (fruits, vegetables, spices, condiments, etc). Beverages like tea, coffee, cocoa and alcoholic drinks like beer, wine and whisky and comfort foods like chocolates and 'betel leaf/pan' also form part of food.

Human food sources in their natural form are cultivated, reared, captured or cultured. Some foods can be taken in raw form while most need some kind of processing to introduce desirable characteristics for making them acceptable, edible and digestible.

Our food selection is conditioned by different factors like environment, climate, availability, economics and faith. Many of us like certain foods because we have been raised eating those foods. In many cases, whatever our parents eat or liked to eat are what we eventually enjoy eating. Food is an integral part of life and plays an important role in formation of human societies and evolving of the civilizations.

1.2 FOOD SOURCE

Plants draw solar energy from the sun and synthesize food with the help of chlorophyll present in them. In this process, known as photosynthesis, the plants make use of both the sun's energy and minerals (such as calcium, phosphorous, potassium and magnesium) in the soil to produce grains, greens, fruits and tubers that become food to others. The energy gathered by the plants is utilized by the herbivores and subsequently by the carnivores who feed on the herbivores. Unicellular aquatic plants (phytoplankton) also gather nutrients from the solar energy. Phytoplankton is eaten by unicellular aquatic animals (zooplanktons). Higher aquatic animals thrive on these zooplanktons.

The chain of transferring energy and organic compounds from one species to another can continue several more times. It eventually ends with the dead animals whose bodies are broken down and used as food or nutrition by bacteria and fungi. As these organisms, referred to as decomposers, feed on the carrion, they break down the complex organic compounds into simple nutrients. Thus the energy transformation chain starts all over again.

1.3 FOOD CHAIN

Food chains, food webs and/or **food networks** describe the feeding relationships between species in an ecological community. They graphically represent the transfer of material and energy from one species to another within an ecosystem. Organisms are connected to the organisms they consume in the biomass transfer.

Here is a figure showing one such food and energy chain:

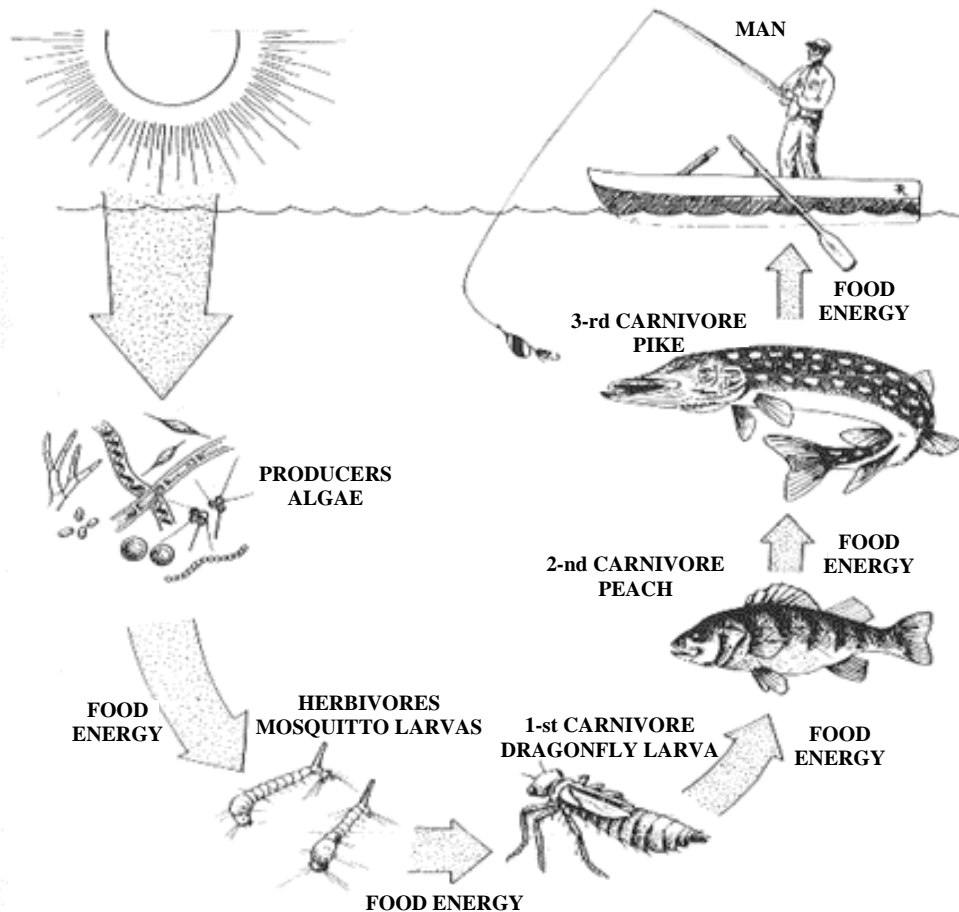


Fig. 1.1: Food Chain

Food chains are also the basic reason for specific pattern of food-borne diseases because of the transfer of disease agents or toxins through them. **Human food chain** is the most important and begins with all activities of agriculture, animal husbandry and fisheries. It involves producing and harvesting food, its processing and marketing and culminates in the food preparation and consumption.

For the foods of animal origin, the chain preceded the animals or their products we eat. The process begins with the raising of plants/feed that are eaten by the meat animals. Today, the food chain is complicated with the recycling of animal wastes to herbivores that induced problems like the 'mad cow disease' (bovine spongiform encephalopathy) and other fouling of food with toxic chemicals. Thus the human food chain form the '**farm-to-fork**' is of public health significance in regard to food safety.

1.4 FOOD SAFETY

Food safety is an important concern. From the beginning of civilization people have been concerned about the quality and safety of foods. Probably our knowledge of food safety began its early stages from the 1600's and concentrated on scientific discoveries. In 1202, King John of England proclaimed the first English food law, the Assize of Bread, which prohibited adulteration of bread with such ingredients as ground peas or beans.

People recognized that food spoils, but the reasons for spoilage and the potential for becoming ill from food were not known. Early food regulations were not aimed at making food safer, but rather at preventing economic fraud.

Food safety regulation issues have become a major source of friction in international trade. Trade in agricultural products, particularly the processed food items, is being increasingly subjected to non-tariff barriers like Sanitary and Phytosanitary (SPS) Regulations related to trade flow. The procedures for settlement of dispute have been identified as key items on the World Trade Organization (WTO) agenda for future multilateral trade talks. As the demand for food safety rises, there is an increased need for higher SPS standards.

1.5 FOOD CONSTITUENTS

Nutrients are naturally occurring chemical substances found in food. There are six categories of nutrients: carbohydrates, proteins, lipids, vitamins, minerals and water. **We will be learning more about food constituents and additives in Block 2 of this course.** The chemistry of the food constituents influences the characteristics of our food.

Carbohydrates, proteins and fats in food provide the energy to our bodies required for performing functions/ to do work. Of these, we usually meet most of our energy needs through carbohydrates and fats. However, when these two nutrients are present in inadequate amounts and cannot meet our body demands, then proteins are also metabolized to give us energy. Just as we measure the weight in grams and length in centimeters, energy value of food is measured in 'kilo calories', or 'Kilo joules'.

1.5.1 Moisture

Every food material contains moisture. It is present in two forms i.e. free water and bound water. It is one of the most important attributes of the food material that affects processing, packaging, preservation and shelf-life of foods.

1.5.2 Carbohydrates

Carbohydrates are a group of substances that contain carbon, hydrogen and oxygen. Carbohydrates occur in plant and animal tissues as well as in micro-organisms in many different forms and amounts. Carbohydrates are the primary source of human energy and preferentially utilised before fats or proteins. One gram of available carbohydrate can provide 16 kJ of energy. Simple carbohydrates include the different forms of sugar (monosaccharides and disaccharides); complex carbohydrates (polysaccharides) include starches and dietary fibers.

1.5.3 Proteins

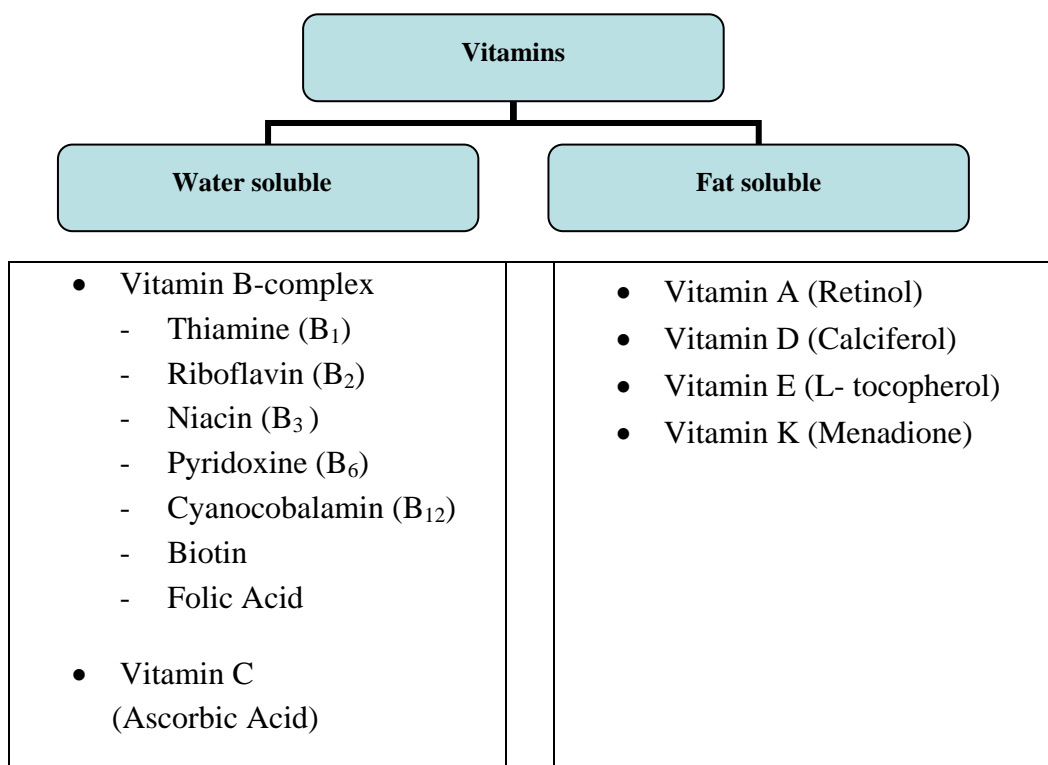
Proteins are organic nitrogenous compounds of high molecular weight and are complex in nature. They are synthesized in plants (ribosomes) from nitrogen, CO₂ and H₂O. Dietary protein is supplied from plant and animal sources. Proteins are polymers of some 21 different amino acids joined together by peptide bonds. Of the 21 amino acids, 10 are essential for human nutrition. Because of the variety of side chains occurring when these amino acids are linked together, the different proteins may have different chemical properties and also widely different secondary and tertiary structures.

1.5.4 Lipids

Lipids consist of broad group of compounds generally soluble in organic solvent but sparingly soluble in water. They are major components of adipose tissue and one of the major structural components of all living cells. Lipids are glycerol esters of fatty acids obtained from plants and animals, traditionally called as fats and oils. Lipids in food exhibit unique physical and chemical properties. Their composition, crystalline structure, melting properties and ability to associate with water and other non-lipid molecules are especially important to their functional properties in many foods.

1.5.5 Vitamins

Vitamins in our food are organic compounds needed in very small amounts (in milligrams and micrograms). They are required for normal metabolism, growth and development and regulation of the cell functions. The vitamins are divided into fat-soluble and water-soluble vitamins. Fat-soluble vitamins include vitamins A, D, E and K. The water-soluble vitamins include the B complex group vitamins and vitamin C. The B complex vitamins include: thiamin, riboflavin, niacin, pyridoxine (vitamin B₆), pantothenic acid, folic acid, biotin, and cyanocobalamin (vitamin B₁₂).



1.5.6 Minerals

Minerals in food refer to the elements other than carbon, hydrogen, oxygen and nitrogen. Minerals in food are found in low concentration but they play key functional roles in health and nutrition of humans. Around 90 elements occur naturally in the earth's crust. About 25 of them are known to be essential to life and are present in living cells. Since our food is derived from living plants or animals, we can expect to find these 25 elements in our food. The minerals in foods are usually determined by ashing or incineration. This destroys the organic compounds and leaves the minerals behind.

1.6 FOOD AND ITS FUNCTIONS

Now let us take a look at the food and its functions. Food comprises an array of chemical compounds encompassing science of nutrients including water, carbohydrates, proteins, fats, vitamins, minerals and roughage required to sustain life. Food performs the following functions:

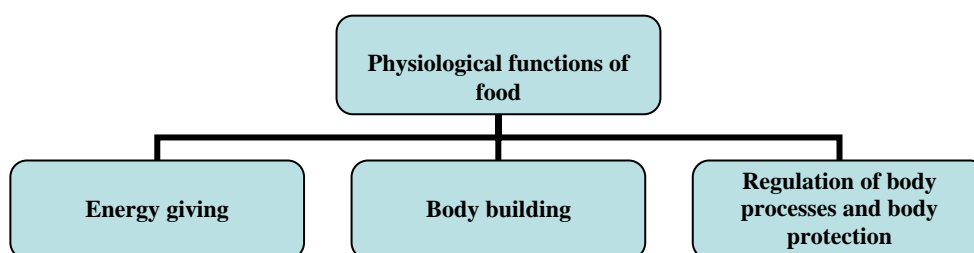
- Physiological functions
- Psychological function
- Social function

1.6.1 Physiological Functions

We know that our food provides us various nutrients such as carbohydrates, fats, proteins, vitamins and minerals.

These nutrients help in the normal functioning of our body process, including the muscle building. The deficiency or excess of one or more of these nutrients can very often result in maladjustment and malfunctioning of our body.

Now we shall see how the food and the nutrients contained in it help in carrying out the physiological function. These can be grouped into three categories.



Energy Giving Function

Food is assimilated in our body and gives us energy for performing physical activities like walking, running, and other physical activities. We also spend energy while carrying out our daily work. You must have experienced that you feel hungry after hard work. It indicates that during physical activity energy is used up by our body. Apart from these, energy is also required for some of the involuntary processes going on inside our body, such as the process of blood circulation, respiration, maintenance of our body temperature, digestion and assimilation of food and excretion of waste products. All these processes are of utmost importance to keep us alive.

We have seen the growing up process in children. He/she gains both in weight and height. It is the growth process. This takes place only if the child eats the right type and amount of food. This particular function of food is known as the body building function.

In our body, not only are new cells and tissues being added every moment but the old ones are also continuously being broken down. Here food helps in the repair and replacement of worn out tissues. Although all the nutrients help in this function, the major ones are proteins, minerals, vitamins and water.

Regulation of Body Process and Protection Function

A number of reactions and processes take place in our body with the help of enzymes such as pepsin, rennin, trypsin. All the enzymes are proteins. (Enzymes are organic chemical substances formed in living cells to help facilitate various reactions in our body. Their role is more like a catalyst and they participate in various processes like respiration, digestion, absorption and metabolism of food, etc.). Thus we can say that these proteins help in regulating various processes in our body. Similarly, vitamins, especially those of the B-complex group, and minerals also help in regulating our body processes. Water is the most important constituent of our body and helps regulate all the body processes. From the body, waste material is thrown out in the form of perspiration, urine and faeces with the help of water.

Some proteins present in our body fight against diseases. These proteins are part of our immune system and are also called 'protective proteins'. They act as soldiers and fight back the enemies i.e. the disease causing organisms. Thus we are saved from a number of infections and diseases.

Similarly, the vitamins keep our body and skin healthy and keep us away from diseases. Think of the cracks in an unhealthy skin which may occur due to the deficiency of some of the vitamins. Through such cracks the disease organisms can enter the body and make us sick.

1.6.2 Psychological Function

Food not only provides various nutrients but it also satiates our hunger and gives us psychological satisfaction. You may have experienced that the food that you particularly like gives you added pleasure. For instance, if you are fond of 'pakoras', fried fish or 'halwa' and you get them in your meal, you experience joy in eating those. Thus the food is also a mood conditioner. Similarly, withdrawal of food, often used as a punishment, can trigger depression or aggressive behaviour. This is the psychological aspect of food. The food thus causes psychological satisfaction or dissatisfaction.

1.6.3 Social Functions

Food has also an important socio-cultural role. It paves the way for social relations development. Man as a social animal likes to give or share food with fellow beings on congenial occasions. Food helps in bringing people closer.

We often see that our social gatherings and functions are followed by some distribution, exchange or sharing of food. At a birthday, wedding or farewell party, food comes in for sharing of the joy and sentiments of togetherness. You must have often invited friends or relatives for tea, drinks, dinner etc. Here food helps in expressing your affection towards them. In the same way,

exchange of sweets on festivals like Diwali, Id, Christmas, etc. is one of the ways of sharing the joy of the occasion with other people. Food and celebrations unite people.

1.7 SACRED FOODS AND FOOD TABOOS

The world's religions and faith groups have accorded certain importance to food within socio-religious practices and cultural traditions. Also we notice that religions and communities have put some restrictions on certain food items, supposedly primarily on health considerations. Certain foods may be considered 'sacred'. Certain others are considered 'taboo' by the rules promulgated by certain religions and faiths. For example, wine and bread in Christian congregations, lentil-cereal-meat pie in Islam and cereal-milk-sugar gruel in Hindu religious gatherings are served as sacred food. On the other hand, Judaism prescribes a strict set of rules, called *Kashrut*, regarding what can and cannot be eaten. Certain denominations of Christianity also hold to these or similar rules. In Islamic practice, the laws of *Haram* and *Halal* dictate, among other things, certain meat foods which may not be consumed. Jains and conservative Hindus often follow religious directives to observe vegetarianism and avoid eating meat. The influence of religion and spiritual beliefs on eating habits has come to reflect in the opportunities for manufacturers and retailers to tailor products in accordance to religious needs and specifications. Specifically addressed are the traditions of *Kosher*, *Halal* and 'vegan' vegetarianism.

There are also unconscious cultural taboos against eating certain vegetables and meat of some animals. For example, conservative sects of Hindus and Jains refrain from eating onion, tuber crops and exotic vegetables. Eating insects like scorpions is a taboo in Europe, but considered elitist in China. Eating dog meat in many societies including the United States and Europe is unacceptable even though there is no law against eating dog meat in those countries. In Southeast Asia, most countries excluding Vietnam rarely consume dog meat either because of Islamic taboos, Buddhist values or animal rights as in the Philippines. Similarly, horse meat is rarely eaten in the US and UK, but is common in some parts of continental Europe and is considered a delicacy in France and Japan (*basashi*).

A fairly recent addition to cultural food taboos is that of eating the meat and/or eggs of endangered species or animals that are otherwise protected by law or international treaty. Examples of such protected species include whales, sea turtles, and migratory birds.

1.8 FOOD AS SOURCE OF NUTRIENTS

In order to understand how we can enjoy greater health and wellbeing, we need to understand the types of food. There are four essential groups of food. For health and wellbeing we require food from all the groups. Many foods contain more than one component of food, and milk contains almost all components of food. Food is often classified as:

- **Carbohydrate**, (including fibre) rich food
- **Protein** rich food
- **Fat** rich food
- **Vitamins** and **Minerals** rich food

1.8.1 Carbohydrate Rich Food

These are used in the body to produce energy. They are broken down in the body to form glucose. The glucose that is not immediately required is stored in the liver and muscles as glycogen. Plants use carbohydrates to build structures and store any excess of energy as starch for example: cereals, starchy roots, vegetables and fruits.

The energy in the body is used for:

- External activities (behaviour), such as work, sport, leisure - that is any movement of the body.
- Internal activities including breathing, pumping blood, digestion and the activities of the immune system.

Non-digestible Carbohydrates (Dietary Fibre)

Fibre, or roughage, refers to the non-digestible carbohydrates in vegetables and to a lesser extent in fruit. The fibre provides the bulk, lubrication, and nutrition for friendly bacteria in the colon. When fibre is combined with water, it swells up and provides the bulk to the digestive system. This makes it easier for food to pass through the intestines. Food also passes through the digestive system faster, so that waste products are retained for less time in the body. Some fibre has the effect of lubricating the contents of the intestines and, therefore, makes the food pass through easily and in a timely manner. In addition, friendly bacteria in the colon feed on fibre and they are, therefore, nourished by it. By helping these friendly bacteria, we enable them to help us to digest the food. Fibre rich foods are therefore, necessary for a healthy and efficient digestive system, e.g. carrots, spinach, lady finger (okra), papaya, apples, etc.

1.8.2 Protein Rich Food

Proteins are used by the body to:

- aid in growth, development and repair;
- build structures such as muscles, tissues and organs, including the heart, lungs and digestive organs;
- produce enzymes, such as those required for digestion; and
- produce hormones, in the endocrine glands.

Proteins, therefore, are needed not only for obvious body structures, such as muscles, but also for the immune and digestive systems, etc. Meat, eggs, fish and dairy products are rich in complete proteins. Quality proteins can also be obtained from certain cereals and beans like the soybean.

1.8.3 Fats and Oil Rich Food

Sources of fat include butter, ghee, animal meat, fish, and vegetable oils. Fats are required for building cell structure, nerves and brain. The brain is 40 per cent fat. Fats are required in the body to:

- insulate the body;
- produce sex hormones and adrenal cortex hormone;
- produce cholesterol (essential for cell membranes and bile salts, for example);
- absorb certain vitamins (A, D, E, and K) and
- store energy.

Fats have got a bad name in recent times, yet they are an essential part of food. The body requires intake of some fat every day for health and well being.

1.8.4 Vitamins and Mineral Rich Food

Vitamins and minerals occur in a variety of foods. By eating a variety of foods, we obtain the necessary vitamins and minerals one needs for sound health. Some examples are fruits and vegetables, milk, egg, fish, etc. Deficiencies or excess in any of these groups of foods could cause illness. Calcium is obtained from, for example, milk and fish. Iron is often obtained from meat, especially liver. Lacto-vegetarians can get their calcium from milk, and vegans (who do not eat any animal products) can get their calcium from fortified soy milk. To obtain one's calcium requirements from non-animal sources, one would have to eat a very large amount of vegetables or fruits.



Check Your Progress Exercise 1

Note: a) Use the space below for your answer.
b) Compare your answers with those given at the end of the unit.

1) What are the major functions of food? Define them.

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2) Name the components of food? Describe the function of lipids and proteins in the body?

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3) Which nutrients are required in our body and what are their functions?

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1.9 CUISINES

A specific set of cooking traditions and practices, often associated with a specific culture or region is called **Cuisine**. A cuisine is primarily influenced by the civilizational culture of the region and ingredients that are available locally or through trade. Religious food laws can also exercise a strong influence on cuisine. Trade and cross cultural interactions of a specific cuisine help that cuisine widen its popularity and acceptance. For instance, the

Japanese cuisine has acquired international status in the post Second War economic boom of that country. In addition to food, a cuisine often includes beverages, including wine, liquor, tea, coffee and other drinks.

Among the significant cuisines of the world are: the Chinese, French, Mediterranean, Indian, Continental European, Arab, Thai, Japanese and American.

The last century has produced enormous improvements in food production, preservation, storage and shipping. Today almost every locale in the world has access to not only its traditional cuisine, but many other world cuisines as well. New cuisines are constantly evolving, as certain aesthetics rise and fall in popularity among professional chefs and their clientèle. Nevertheless, just like Indian cuisine has spread its influence to South Asia and Far East. French cooking techniques have been a major influence on virtually all Western cuisines.

Cuisine of India is characterized by its sophisticated and subtle use of many spices and herbs. Considered by some to be the world's most diverse cuisine, each family of this cuisine is characterized by a wide assortment of dishes and cooking techniques. Though a significant portion of Indian food is vegetarian, many traditional Indian dishes also include chicken, goat, lamb, fish, and other meats. Beef is not eaten by most Hindus.

Food is an important part of Indian culture, playing a role in everyday life as well as in festivals. In many families, everyday meals are usually sit-down affairs consisting of two to three main course dishes, varied accompaniments such as chutneys and pickles, carbohydrate staples such as rice and roti (bread), as well as desserts.

Generally, Indian cuisine can be split into four categories: North Indian, South Indian, East Indian, and West Indian. Despite this diversity, some unifying threads emerge in the art of Indian cuisine. Varied uses of spices are an integral part of food preparation, and are used to enhance the flavor of a dish and create unique flavour (taste and aroma) and character.

Cuisine across India has also been influenced by various cultural groups that entered India throughout history, from regions as diverse as West Asia, Central Asia and Europe. Cuisines of the Indian subcontinent includes cuisines from the peninsular region of South Asia, which includes India, Pakistan, Afghanistan, and Bangladesh, as well as Sri Lanka, Nepal, Bhutan, Tibet (part of China), and the Maldives. One characteristic component of the cuisines of these regions is rice and curry dishes.

The following are the important cuisines of India:

North Indian Cuisines: Punjabi cuisine, Kashmiri cuisine, Benarasi cuisine, Sindhi Cuisine.

South Indian Cuisines: Udupi cuisine, Kerala cuisine, Andhra cuisine, Hyderabadi cuisine, Karnataka cuisine, Tamil cuisine.

West Indian Cuisines: Maharashtrian cuisine, Malvani cuisine, Goan cuisine, Rajasthani Cuisine, Gujarati cuisine.

East Indian Cuisines: Bengalee cuisine, Assamese cuisine, Bihari Cuisine, Traditional cuisines of Jharkhand, Oriya Cuisine, Anglo-Indian cuisine.

1.10 CONSUMPTION TRENDS

Food is very much a part of popular culture, and the beliefs, practices, and trends in a culture affect its eating practices. Popular culture includes the ideas and objects generated by a society.

There has been an increasing trend toward **consumerism**, convenience foods, health foods, functional foods and foods of ethnic diversity. Consumerism is an urban trend that is reflected in more people eating away from home. Internationally, the proportion of money spent on food eaten away from home, as well as in restaurants, has been steadily increasing. This also has resulted in rising demand for dining at formal sit-down restaurants, at **fast-food** eateries, cafes, or purchasing food from street vendors.

Food consumption trends too are changing the world over. This influences the food industry. Rapid economic and income growth along with the globalization are encouraging a dramatic shift in food preference and consumption, particularly in Asian countries. The shift is happening from the staple cereals increasingly towards livestock and dairy products along with increased consumption of fruits, vegetables, fats and oils (rich in poly unsaturated fatty acids). The traditional food consumption patterns are giving way to western dishes and diet. The diet transition is characterized by increased consumption of high protein and energy dense food. However, demand for individual foods is more responsive to prices as consumers substitute among alternative food commodities. Rising incomes also tend to push up food prices as consumers demand more convenience, quality and safety. Demographic factors such as size of the family unit and age group of the population also impact consumption pattern.

Fast food accounts for the largest and fastest rising share of sales in the food industry. Sales in fast-food industries now outpace the sales in full-service restaurants. People want quick and convenient meals. They do not want to spend too much time in preparing meals, travelling to pick up meals, or waiting for meals in a restaurant. Consumers want to combine mealtime with time engaged in other activities such as shopping, work, recreation or travel. Urbanizing lifestyles, changing food tastes, ease sought in food preparation, bid to save time and money spent for food and inadequate cooking facilities in crowded urban slums are among the reasons for the shifts in food consumption pattern. The value of women's time is an important factor affecting house hold expenditure on food. More and more women entering the work force to supplement the family income also is affecting the household food cooking. The global supermarket chains and fast food restaurants are moving in to occupy the space. For example, food multinationals like the McDonalds, Pizza Hut, Kentucky Fried Chicken (KFC), Burger King, Dominos Pizza, Papa Jones and Wall Mart are now showing up their presence in every neighbourhood.

On the other hand, the changing food trends are also resulting in eating disorders and malnutrition as in binge eating resulting in obesity, malnutrition and anorexia nervosa.

1.11 FOOD INDUSTRY

From the kitchens in homes, food preparation has travelled a long way to become an industry worth Rs. 45,00,000 crores and is still expanding.

The food industry is divided into four major segments:

- i) Agricultural Production
- ii) Manufacturing/ Processing
- iii) Distribution
- iv) Marketing

Production: Production includes such activities as farming, ranching, orchard management, fishing and aquaculture. Technologies involved in production of the raw materials include the selection of plant and animal varieties, cultivation, growth, harvest, slaughter, and the storage and handling of the raw materials.

Manufacturing/ processing: Manufacturing converts raw agricultural products to more refined or finished products. Manufacturing requires many unit operations and processes that are at the core of food sector.

Distribution: Distribution deals with those aspects conducive to product sales, including: product form, weight and bulk, transportation, storage requirements and storage stability.

Marketing: Marketing is the selling of foods in raw and processed form and involves wholesale, retail, institutional distribution and restaurants.

These four divisions often overlap. Nevertheless, the food industry requires planning and synchronization in all its divisions to be successful. Another way of dividing the food industry is along major product lines:

- Cereals and bakery products
- Meats, fish and poultry
- Dairy products
- Fruits and vegetables
- Sugars and other sweets
- Fats and oils
- Non alcoholic beverages/alcoholic beverages

These divisions are typical where consumer consumption is measured and reported. Each segment can be divided into number of sub-segments. For example cereal processing may include wheat processing, pulse processing, bakery industries, weaning foods industries, fast food manufacturing, etc.

Allied industries: Many companies do not sell food directly but they are deeply involved in the food industry. These are called allied industries. Allied industries produce non-food items that are necessary for manufacturing and marketing food. The packaging industry is a good example. Some specific examples include cans, food colour and flavour, paper products, and plastic products. Chemical manufacturers represent another group of allied industries. They supply the acidulants, preservatives, enzymes, stabilizers, and other chemicals used in foods. Monitoring and regulatory agencies such as the PFA, AGMARK, BIS, APEDA, FPO, Food & Drug Administration (FDA), lawyers, consumer action and information agencies, and other regulatory agencies are also part of allied industries.

1.12 PROCESSING AND VALUE ADDITION

India is one of the largest producers of food and food raw material like cereals and milk. The country has comparative advantages in value addition to agricultural products. However, it is not happening because of several factors including a lack of sustained and favorable policy framework. The domestic demand for processed food is huge because of the geographical vastness and huge population size. Key to giving a fillip to India's food production would be bridging the significant gap between potential yield and actual yield and enlarging the food processing to minimize all the wastages in the food production and distribution. The onus has got to be on hi-tech harvest and post-harvest technologies. The production mix of both agriculture and value addition has to be reorganized in line with the changing consumer demands. Organic foods, nutraceuticals and functional foods are coming into focus. Market for such foods is increasing rapidly with increasing health consciousness and growing concern about environmental issues.

Post-harvest value addition includes primary, secondary and tertiary processing and operations performed on farm produce. It is to provide longer shelf life, maintain/ improve quality, and enhance form, space and time utility of the produce for food, feed, fibre, fuel and industrial purposes.

Food Processing Industry in India

The food processing industry is one of the largest industries in India - it is ranked fifth in terms of production, consumption, export and expected growth. The industry is worth Rs 350,000 crores including Rs. 99,000 crores worth of value added products. Food processing is a large sector that covers activities such as agriculture, horticulture, plantation, animal husbandry and fisheries. It also includes other industries that use agriculture inputs for manufacturing of edible products. Processed food industry in India contributes 6.3 per cent of the GDP, and accounts for 13 per cent of export and 6 per cent of the capital investment. India produces about 600 million tonnes of farm produce annually.

In spite of food production & facilities, the level of processing has been as low as 2% in case of fruits and vegetables in comparison to 60 per cent in U.K. and USA, 80 per cent in Malaysia, and 30 per cent in Thailand. The level of processing in other commodities has been to the tune of 14 per cent in milk, 4 per cent in fish and 1 per cent in meat and poultry. Thus, India's contribution to processing of farm produces in the year 2004-2005 has been only about 1 per cent at the global level and 2 per cent at the national level.

Value Addition

The market for processed foods in 2014-2015 in comparison to 2003-2004 is expected to go up 11 times for fruits and vegetables, 4 times for dairy, 15 times for poultry, 4.3 times for buffalo meat, 1.4 times for milled rice, 1.5 times for milled wheat, 16 times for ready-to-eat (RTE) foods, 5.4 times for marine products, 9.3 times for sugar and sugar based products, 4.8 times for alcoholic beverages, 2.5 times for aerated cold beverages, twice for pulses and 4.5 times for spices. The growth per annum in processed foods would be about 10%, primary processed foods 7 per cent, and value added foods 15 per cent. The share of value added products would increase from the existing 20 per cent to 35% by 2014-2015. The level of processing in organized sector is expected to increase by 8 percent in fruits and vegetables, dairy (30 percent), buffalo meat

(45 percent), poultry (25 percent), and marine products (20 percent). India, with 5147 certified “organic farms” in 2005, ranked 33 in the world having 0.114 million ha under organic cultivation out of total 31 million ha in the world. The food processing industry ranks fifth in its contribution to value addition but tops the list in terms of employment opportunities with approximately 15 lakhs employed consisting of 19 percent of the total investment in the industrial sector but contributes 18 percent to the GDP.

1.13 NATIONAL FOOD PROCESSING POLICY

The Government has come out with a draft national food processing policy with a vision to motivate farmers and food processors and to provide interactive coupling between technology, economy, environment and society for speedy development of food processing activities to build up a substantial base for production of value added agro food products for domestic and export markets with a strong emphasis on food safety and quality enabling the farmers especially to realize direct benefits of new technology and marketing network and to ensure adequate availability of quality food products for the consumers at economic prices.

The policy will seek to create an appropriate environment for the entrepreneurs to set up food processing industries through rationalization of tax structure, harmonization & simplification of food laws, promotion campaign to create market for processed foods by providing financial assistance to Industry Associations, NGOs/ cooperatives, private sector units and State Government organizations. It also includes infrastructural developments programmes/ schemes like establishment of cold chain, low cost pre-cooling facilities near farms, cold stores and grading, sorting, packaging facilities, application of biotechnology, remote sensing technologies, energy saving technologies and technologies for environmental protection, building up a strong infrastructural base for production of value added products with special emphasis on food safety and quality matching international standards, etc. The policy has many backward and forward linkages between farmers, market, processors and consumers.

1.14 FOOD TRADE

Till recently, India’s agriculture trade policy has been primarily driven by the objective of attaining self-sufficiency and self reliance in order to eradicate hunger and provide essential food at reasonable prices. The Central and State governments procure food grains from the growers on the basis of the procurement prices fixed by the government. This is used for maintaining the public stocks for disbursement among low-income groups at subsidized prices through the Public Distribution System (PDS) network. Earlier, the efforts were to insulate the domestic market from global market by restrictive trade policies, high tariff and non-tariff barriers, and government controls and regulations over agricultural trade. However, India’s adherence to the WTO trade norms is changing the situation. Agricultural exports and imports are getting liberated and globalized.

Still India’s tariffs on agricultural products remain high by global standards. However, the country is pledged to bring it down to ASEAN (Association of South East Asian Nations) levels. Tariff quotas are maintained on some edible oils, maize and milk powder. Import prohibitions are in place for certain fats,

oils of animal origin, and beef, based on GATT (General Agreement to Trade and Tariffs) Article XX that permits countries to restrict imports on religious grounds. Some products, such as wheat, rye, oats, maize, rice, canary seed and other cereals, continue to be traded by canalizing agencies like the State Trading Corporation, Food Corporation of India and NAFED (National Agricultural Cooperative Marketing Federation of India Ltd.).

The international trading system has taken on an increasingly consumer-driven focus. It is paying heightened attention to maintaining public confidence in the food safety and food quality systems, while simultaneously ensuring to handle a sound, science-based approach regulatory/technical trade issues. Now food is a global commodity. Food is traded and shipped around the world. The food processing industries are opening subsidiaries in other countries and fast food companies are opening outlets all over the world. Globalization and WTO are affecting the world food processing industries to a great extent with the new global standards and food safety regulations.



Check Your Progress Exercise 2

Note: a) Use the space below for your answer.
b) Compare your answers with those given at the end of the unit.

1) What is food chain? Define the concept of producer and consumers.

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2) What is value addition? Define the various ways for achieving it.

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3) Discuss the change in consumption trends for processed food in India.

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1.15 LET US SUM UP

Food is essential for all living things and human beings for their energy needs. Food has three major functions, namely physiological, psychological and social. Nutrition is the study of the functions of food consumed and the processes by which it is used up for physical growth and staying healthy. There are six categories of nutrients: proteins, carbohydrates, lipids, vitamins, minerals and water. The chemistry of these nutrients influences the characteristics and processing of the food.

Food chain denotes the feeding relationships between species in an ecological community. They graphically represent the transfer of material and energy

form one species to another within an ecosystem. Food chain in an ecosystem starts from the primary producer (plants) and moves on to consumers (primary, secondary and tertiary), the decomposer and recycling.

The food industry is divided into production, manufacturing, distribution and marketing. The industry is sensitive to its linkages and changes. Food is now a global commodity with sensitivity to output and marketing trends.

The Agro-Food processing Industry sector in India is one of the largest in terms of production, consumption, exports and growth prospects. India is the third largest producer of food in the world but the value addition to processed food is meagre seven per cent. India's share in international food trade is less than one per cent.

The government has come out with a draft of national food processing policy with a vision to motivate and provide interactive compiling between all stake holders. The policy will seek to create an appropriate environment for the entrepreneurs to set up food processing industries through creating enabling environment, infrastructure developing with backward and forward linkages.

Food is now traded and marketed on a global basis. The variety and availability of food is no longer restricted by the diversity of locally growth food or the limitation of local growing season. India's agriculture trade policy is primarily driven by the objective to attaining self-sufficiency in order to eradicate hunger and provide essential food at reasonable prices. Rapid economic and income growth, organization and globalization are leading to a dramatic shift in diet patterns from staples to ready to eat and convenient foods.

1.16 KEY WORDS

Food	: Foods are materials, which in their naturally occurring, processed or cooked forms, are consumed by human beings for their nourishment, sustenance and enjoyment.
Food Safety	: Food safety is protecting the food supply from microbial, chemical and physical hazards or contamination that may occur during all stages of food handling & processing.
Phyto-chemicals	: Active derivatives extracted from plants exhibit diversified physiological & pharmacological effects.
Nutrition	: It is the study of the processes by which food is digested, absorbed and utilized to grow and maintain good health.
Food Processing	: Transformation of food (raw material) to desired product.
National Food Processing Policy	: Draft of government on food processing policy of India.

Allied Industries	: The industries indirectly associated with food processing industries.
Food Trade	: The export & import of raw and processed food products.
Post Harvest Value Addition	: Includes processing and operations performed on farm produce to add values in terms of quality, shelf life, safety, etc.
Food Science	: Food Science is the discipline in which the biological, chemical and physical sciences and concepts of engineering are used to study the nature of foods, causes of their deterioration and the principles underlying food processing leading to enhanced food quality & suitability.
Food Technology	: It is the application of food science to the selection, presentation, processing, packaging, distribution and production/preparation of safe nutritious and whole some food.
Food Chemistry	: Covers the basic composition, structure and properties of foods and the chemistry of changes occurring during processing & utilization.
Food Microbiology	: Is the study of the microbial ecology related to foods, the effect of environment on food spoilage and food manufacture by fermentation, the physical, chemical and biological destruction of micro-organisms in foods, the microbiological examination of food stuffs and public health and sanitation microbiology.
Food Processing	: Covers general characteristics of raw food materials, principles of food preservation, processing factors that influence quality, packaging, water content, waste management and Good Manufacturing Practices (GMP) and sanitation procedures.
Food Engineering	: Involves study of engineering concepts and unit operations used in food processing. Food engineering also includes material and energy balances, thermodynamics, and electrical and thermal conductivity, fluid flow and heat & mass transfer related to freezing, dehydration, thermal processing, irradiation, non-thermal and other processing methods.
Food Analysis	: Deals with the principles, methods and techniques necessary for quantitative physical and chemical analysis of food

products and ingredients. The analysis is mainly done to check the compliance of food to the standards and regulations for food quality and safety.

- Food Safety** : Food safety is protecting the food supply from microbial, chemical and physical hazards or contamination that may occur during stages of food production and handling. This includes growing, harvesting, processing, transporting, preparing, distributing and storage. The goal of food safety monitoring is to keep food wholesome.

- New Food Product Development (NPD)** : New Product Development, by definition is a future oriented practice. It is an effort to foresee the future needs of the market place and to devise state-of-the art products. The basic principle of product development is to identify the needs of the buyers and the users, and design the products towards meeting these needs.

- Food Security** : Food Security is assuring that people have access to enough food to lead healthy and productive lives.

- Functional Foods** : Foods that encompass potentially healthful products, including any modified food or food ingredient that may provide health benefits beyond the traditional nutrients it contains. The term is used when referring to foods that have been **fortified**, have specific **phytochemicals** or active **microorganisms** added, or have been developed using **genetic** engineering techniques. However, all foods can support health in some way, and there is no legal definition of *functional food*. In addition, the actual benefit of these foods, if any, can vary and is open to interpretation. For example, both a candy bar and orange juice may have additional **calcium** added, and can therefore, be called functional foods. The consumer must determine the benefit of such items.

- Organic Food** : Organic food can be defined as food produced and processed in the natural way without involving the usage of any kind of pesticides, inorganic fertilizers, chemical preservatives or artificial inputs.

- Raw food** : Foods in their original, un-heated (uncooked) state are considered raw and alive. Raw food may include fruits, vegetables, nuts, seeds, sprouts, grains and legumes in sprouted form,

	seaweed, microalgae (such as spirulina and chlorella, etc.), and fresh juices.
Genetically Modified Foods (GM Foods)	: GM foods are food stuffs prepared from plants/ animal/ micro-organisms that have had their genome altered through genetic engineering.
Nutraceutical	: Nutraceutical is a combination of “Nutrition” and “Pharmaceutical” and refers to the specific agent (phytochemical) that has the potential for promoting health and preventing disease. For example Lycopene is responsible for antioxidant activity of tomatoes.
Food Systems	: A sustainable community food system is a collaborative network that integrates sustainable food production, processing, distribution, consumption and waste management to enhance the environmental, economic and social health of a particular place. Farmers consumers and community partner to create a more locally based, self reliant food economy.



1.17 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) Your answer should include following points:
 - Physiological Function
 - Psychological Function
 - Social Function
- 2) Your answer should include following points:
 - Major Constituents
 - Minor Constituents
 - Chemical Composition, Structure & Functions
- 3) Your answer should include following points:
 - Major and Minor Nutrients
 - Significance, functions in body
 - Deficiency diseases

Check Your Progress Exercise 2

- 1) Your answer should include following points:
 - Feeding relationships between species
 - Producer – the beginner of food chain
 - Consumers – primary, secondary, tertiary

2) Your answer should include following points:

- Improvement in production, processing, shelf life, trade & quality

3) Your answer should include following points:

- Shift in consumption trend from staples to RTE, convenient food
- Income, urbanization & globalization affecting the diet pattern

1.18 SOME USEFUL BOOKS

Abdul Kalam, A.P.J and Rajan, Y.S. (2002) *India 2020 A Vision for the New Millennium*, Penguin Books Ltd. New Delhi

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Potter, N.N. and Hotchkiss, J.H. (1995) *Food Science*, 5th Edition. Chapman & Hall Publishing Inc, New York.

Shakuntala Manay, N. and Shadak Sharaswamy, M. (1987) *Foods Facts and Principles*, Wiley Eastern Limited. New Delhi

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