



SUSTAINABLE DEVELOPMENT GOALS AND SUSTAINABILITY

Dr. PREM SONWAL



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and Sustainability**

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Study of Nutritional Availability Patterns in Maharashtra

Sachin K Pise*

Introduction:

The study of nutritional availability patterns in a region assumes significance due to a number of reasons. It provides a reliable evaluation of food surplus or food deficit situation and affords an important tool for planning a rational food regulation system in an area. The surplus or deficit availability of nutrients affects the regional distribution of population and mobility behaviour of people and hence it may be employed as a yardstick for gauging the level of socio-economic attainments. The nutritional availability connotes the actual food available for human consumption in an area and in a given period. It must be distinguished from food intake or food consumption expressed in terms of the availability quantity of nutrients. Since the purpose of nutritional availability must rest on the determination of the quantity of food that may fetch human consumption locally or otherwise. An effort has been made in the present study to present a systematic and interpretative analysis of per caput food availability in different parts of Maharashtra measuring in terms of the nutritive value of different food constituents. The aspect of nutritional availability, i.e. quantitative and qualitative, has been considered. Therefore, former has been measured as caloric content of the food stuffs and the latter as the value of different nutrients, viz. Proteins, vitamins, minerals, etc., which are available different stuffs.

Methodology:

FAO (1957) and Sukhatme (1962) have suggested two methods of estimating the level of food availability or food consumption in an area, viz the food balance sheet method and consumer survey method. The consumer

* Assistant Professor, Department of Geography, Annasahen Vartak Mahavidyalaya, Vasai Road West, Palghar-401202 (Maharashtra)

survey method is based on a representative sample of households in a region and ideally covers their total expenditure in a given period for food and other items, the quantities of food purchased and consumed. This method is useful in smaller areas. Maharashtra, the study is so large that this method is difficult to be used. The food availability has been calculated with the help of food balance sheet method which has been adopted by Dube and Mishra (1981). The food balance sheet shows the estimated per caput per day availability of a foodstuff the caloric value and content of other nutrients, proteins, minerals, vitamins, etc. can be calculated by diet. Thus for the analysis of regional and spatial variations of food availability in Maharashtra food balance sheets have been prepared. The data derived from those sheets were compiled to depict spatial variation therein.

KEY FUNCTIONS ESSENTIAL NUTRIENTS:

MACRONUTRIENTS:

Nutrients that are needed in large amounts are called macronutrients. There are three classes of macronutrients: carbohydrates, lipids, and proteins. These can be metabolically processed into cellular energy. The energy from macronutrients comes from their chemical bonds. This chemical energy is converted into cellular energy used to perform work, allowing our bodies to conduct their basic functions. A unit of measurement of food energy is the calorie. On nutrition food labels, the amount given for "calories" is actually equivalent to each calorie multiplied by one thousand. A kilocalorie (Calorie) is the amount of heat generated by a particular macronutrient that raises the temperature of 1 kilogram of water 1 degree Celsius. On the Nutrition Facts panel, the calories within a particular food are expressed as kilocalories, which is commonly denoted as "Calories" with a capital "C" (1 kcal = 1 Calorie = 1,000 calories). Water is also a macronutrient in the sense that you require a large amount of it, but unlike the other macronutrients, it does not provide calories.

CARBOHYDRATES

Carbohydrates are molecules composed of carbon, hydrogen, and oxygen. The major food sources of carbohydrates are grains, milk, fruits, and starchy vegetables, like potatoes. Non-starchy vegetables also contain carbohydrates but in lesser quantities. Carbohydrates are broadly classified into two forms based on their chemical structure: simple carbohydrates, simple sugars, and complex carbohydrates.

Simple carbohydrates consist of one or two basic units. Examples of simple sugars include sucrose, the type of sugar you would have in a bowl on the breakfast table, and glucose, the type of sugar that circulates in your blood.

Complex carbohydrates are long chains of simple sugars that can be unbranched or branched. During digestion, the body breaks down digestible complex carbohydrates into simple sugars, mostly glucose. Glucose is then transported to all our cells, stored, used to make energy, or used to build macromolecules. Fiber is also a complex carbohydrate, but digestive enzymes cannot break it down in the human intestine. As a result, it passes through the digestive tract undigested unless the bacteria that inhabit the colon or large intestine break it down.

One gram of digestible carbohydrates yields four kilocalories of energy for the body's cells to perform work. Besides providing energy and serving as building blocks for bigger macromolecules, carbohydrates are essential for the nervous system's proper functioning, heart, and kidneys. As mentioned, glucose can be stored in the body for future use. In humans, the storage molecule of carbohydrates is called glycogen, and in plants, it is known as starch. Glycogen and starch are complex carbohydrates.

PROTEIN

Proteins are macromolecules composed of chains of subunits called amino acids. Amino acids are simple subunits composed of carbon, oxygen, hydrogen, and nitrogen. Food sources of proteins include meats, dairy products, seafood, and various plant-based foods, most notably soy. The word protein comes from a Greek word meaning "of primary importance," which is an apt description of these macronutrients; they are also known colloquially as the "workhorses" of life. Proteins provide four kilocalories of energy per gram; however, providing energy is not protein's most important function. Proteins provide structure to bones, muscles, and skin and play a role in conducting most of the chemical reactions that take place in the body. Scientists estimate that greater than one-hundred thousand different proteins exist within the human body. The genetic codes in DNA are basically protein recipes that determine the order in which 20 different amino acids are bound together to make thousands of specific proteins.

LIPIDS

Lipids are also a family of molecules composed of carbon, hydrogen, and oxygen, but they are insoluble in water, unlike

carbohydrates. Lipids are found predominantly in butter, oils, meats, dairy products, nuts, seeds, and processed foods. The three main types of lipids are triglycerides (triacylglycerols), phospholipids, and sterols. The main job of lipids is to provide or store energy. Lipids provide more energy per gram than carbohydrates (nine kilocalories per gram of lipids versus four kilocalories per gram of carbohydrates). In addition to energy storage, lipids serve as a major component of cell membranes, surround and protect organs (in fat-storing tissues), provide insulation to aid in temperature regulation, and regulate many other body functions.

WATER

There is one other nutrient that we must have in large quantities: water. Water does not contain carbon but is composed of two hydrogen's and one oxygen per molecule of water. More than 60 percent of your total body weight is water. Without it, nothing could be transported in or out of the body, chemical reactions would not occur, organs would not be cushioned, and body temperature would fluctuate widely. On average, an adult consumes just over two liters of water per day from food and drink combined. Since water is so critical for life's basic processes, the amount of water input and output is significant, a topic we will explore in detail

MICRONUTRIENTS

Micronutrients are nutrients required by the body in lesser amounts but are still essential for carrying out bodily functions. Micronutrients include all the essential minerals and vitamins. There are sixteen essential minerals and thirteen vitamins. In contrast to carbohydrates, lipids, and proteins, micronutrients are not sources of energy (calories), but they assist in the process as cofactors or components of enzymes (i.e., coenzymes). Enzymes are proteins that catalyze chemical reactions in the body and are involved in all aspects of body functions, from producing energy to digesting nutrients to building macromolecules. Micronutrients play many essential roles in the body.

MINERALS

Minerals are solid inorganic substances that form crystals and are classified depending on how much of them we need. Trace minerals, such as molybdenum, selenium, zinc, iron, and iodine, are only required in a few milligrams or less. Macro minerals, such as calcium, magnesium, potassium, sodium, and phosphorus, are required in hundreds of

milligrams. Many minerals are critical for enzyme function. Others are used to maintain fluid balance, build bone tissue, synthesize hormones, transmit nerve impulses, contract and relax muscles, and protect against harmful free radicals in the body that can cause health problems such as cancer.

VITAMINS

The thirteen vitamins are categorized as either water-soluble or fat-soluble. The water-soluble vitamins are vitamin C and all the B vitamins, including thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folate and cobalamin. The fat-soluble vitamins are A, D, E, and K. Vitamins are required to perform many functions in the body, such as making red blood cells, synthesizing bone tissue, and playing a normal vision, nervous system function, and immune system function.

Nutritional requirements:

In the planning of a diet, energy requirement, i.e. caloric food requirements of the individual need to be considered by the nutritional geographer. Besides, energy food also comprises such nutrients as proteins, fats, minerals, and vitamins which are essential for the body. Experimental work in nutrition have revealed that an adequate diet must contain sufficient quantities of some forty different chemical substances and that only one of these needs to be deficient for the remainder to be in adequate to support health (Carpenter, 1969). FAO and WHO (1975) have recommended the requirement of calories, proteins, and other selected nutrient based on the amount considered necessary to meet and to ensure good health, assuming that energy requirement are met. Obviously, the nutritional requirements vary with age, size of the body, sex, activity, occupation, foods to be digested, clothing, temperature of the body, the surrounding atmosphere functioning of certain glands of internal secretion, etc. mukharjee (1981), Swaminathan and Bhagwan (1960), Aykroyd (1962), and Goplan (1980) have suggested the standard requirements of all the necessary nutrients in a daily diet as recorded in the following.

The first function of food is to provide the energy, which it supplies in a chemical form. The chemical energy is liberated in the tissues and converted by the muscles into chemical work which enables the individuals to carry out the physical, mental and socio-economic activity and provides heat necessary to maintain the body temperature. Generally proteins, fats, and carbohydrates are oxidised in the body to provide the energy required

for various activities of life. While vitamins and minerals do not supply energy, they play an important role in the regulation of several essential metabolic processes in the body. Some minerals are important components in the body structures like bones and teeth. The deficiency of food nutrients causes a wide range of deficiency diseases and retards the working capacity of individuals.

Table:1 Recommended per Caput per Day Requirements of Nutrients

Nutrients	Requirements
Energy	2400 calories
Proteins	68 gram
Fats	60 gram
Carbohydrates	605 gram

Minerals

Calcium	900 miligram
Phosphorus	1000 miligram
Iron	17 miligram

Vitamins

Vitamin A	1500 microgram
Vitamin B1	1.3 miligram
Vitamin B2	1.4 miligram
Vitamin B2 (niacin)	12.6 miligram
Vitamin C	49 miligram

Table:2 Per Caput per Day Availability of Nutrients in Maharashtra.

Nutrients	Requirements	Actual Availability
Energy	2400 calories	1970 calories
Proteins	68 gram	64 gram
Fats	60 gram	30 gram
Carbohydrates	605 gram	366 gram

Delivery and early childhood percentage in various districts of Maharashtra.

Calorie Availability:

About one-fifth of the districts of the state are included under the surplus category where availability of calories is more than the recommended requirements i.e. 2400 calories per caput per day. The surplus area in western Maharashtra including the districts like pune, Kolhapur, Satara, and Sangali. Average calories are 1970 in Maharashtra.

Proteins Availability:

The sufficiency of protein in a diet is an important measure of the adequacy and quality of the diet. Their importance is enhanced many times because they are required for the growth and development of body. It forms the machinery of the body, the pumps, muscles, catalysts, membrabnces and viral fluids like blood. Protein may be derived from two sources, i.e. animal sources and vegetable sources. Animal proteins are derived mostly from meat, fish, milk and its products. Among vegetable sources nuts and pulses are important. Soya bean is unique in vegetable protein sources while cereals and vegetables are poor respect of proteins content.

In Maharashtra proteins are obtained from cereals, pulses, and proteins availability is about 64 grams as against the recommended requirement of 68 grams.

Fats Availability:

The foodstuffs that are rich in facts are oilseeds and nuts. Cereals. Pulse, and vegetables contain negligible amount of fat. Oilseeds and milk are the only sources of facts in Maharashtra. It has been found that the availability of fat is very low in the state and animal fats are practically negligible. Per caput per day availability of fats is only 30 grams as against the requirement of 60 gram. Fars availability is seen in Latur, Nanded, Osmanabad, and Aurangabad districts in Maharashtra. Rest of the state is deficit in this regard.

Carbohydrates Availability:

They play a key role in providing bulk, and thereby, contribute to bowel movement and elimination of toxic components from the system (Leveille, 1975). Carbohydrates can be absorbed into the blood stream and utilized by the tissue cells only as simple sugars, such as glucose. The

availability of carbohydrates is only 366 grams as against the recommended requirement of 605 gram. It is very high in Jalgaon district and very low in Sindhudurg district.

Minerals Availability:

Minerals constitute an essential part of a perfect human diet. Three types of minerals are necessary in diet, calcium, phosphorus, and iron. Bones and teeth are made up mainly of calcium and phosphorus, and iron is important constituent for stimulation of blood formation. Calcium percentage is mostly found in Konkan more than 540 miligram calcium is seen there. Phosphorus range is more in Satpura ranges and in Chandrapur and Gadchiroli districts. Remaining Maharashtra this is also more which is 1300 miligram against the 1000 miligram. Iron availability is also more in state Maharashtra which is 29 miligram.

Vitamins Availability:

They are essential for body growth and health. It has been that many diseases like night-blindness, dental decay, dental caries, scurvy, beri-beri, etc. are chiefly the result of the deficiency of vitamins. Most of the vitamins are now being referred to in a majority of cases by names relating to their chemical structures, as for example carotene (vitamin A), thiamine (Vitamin B1), etc. Vitamin A is present in some animal products like butter, ghee, whole milk, curd etc as well as ripe fruits as mangoes, papayas and tomatoes are rich in this Vitamin. In our study District Nashik and District Pune is dominant in Vitamin A. Average is 728 microgram in Maharashtra state.

Vitamin B1 & B2 contains 1.47 miligram and 1.2 miligram in Maharashtra. Vitamin B1 is concerned with the proper functioning of the nervous system and with carbohydrates metabolism. Its deficiency results in many diseases like digestive disturbances, growth failure, weakness, anemia, beri-beri etc. In Maharashtra Vitamin B1 deficient in Palghar District.

Vitamin B2 is concerned with several oxidation processes inside the cell. Deficiency of riboflavin in daily diet may cause loss of hair, soreness of the lips and tongue. Wheat, pulses, green leafy vegetables, milk, egg, fish and good sources of riboflavin. In Maharashtra districts in Konkan are very dominant in Vitamin B2.

Vitamin B2 (niacin) is a vitamin intimately concerned in several metabolic reactions. Deficiency of niacin, pulses, nuts, and meat are good sources of niacin and groundnut. The availability of Vitamin B2 is 13.2 miligram in Maharashtra. Marathwada region is very dominant in Vitamin B2.

Vitamin C is found in fresh fruits and green vegetables. Besides, orange, lemon, grape-fruits and amia are its richest source. In Maharashtra Nashik District, Pune District, Jalgaon District, and Nagpur District are very strong in Vitamin C. Remaining state there are 11 miligram Vitamin C.

Conclusion:

The quantitative and qualitative aspects of nutrients availability, have been discussed in the present study, are the best indicators to the determination of nutrient availability in regions. There are some geographical factors like slope, terrain, plain, plateaus, soil, climate are directly affecting on fats, minerals, proteins and Vitamins. On an Average Maharashtra is medium in nutrient productivity.

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